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THE LONDON NATURALIST

The journal of the
LONDON NATURAL HISTORY SOCIETY

No 68

Published 1989
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LONDON NATURAL HISTORY SOCIETY

The Society welcomes new members, both beginners and experts. Its Area lies within a 20-mile (32 km) radius of St Paul's Cathedral and here most of its activities take place. Although much covered with bricks and mortar, it is an exciting region with an astonishing variety of flora and fauna. The Society comprises sections whose meetings are open to all members without formality. For those interested in arachnology, archaeology, botany, conchology, conservation, ecology, entomology, geology, herpetology, mammalogy, ornithology, palaeontology or rambling, there is a section ready to help.

Publications

The London Naturalist, published annually, contains papers on the natural history and archaeology of the London Area, including records of plants and animals.

The London Bird Report, also published annually, contains the bird records for the London Area for each year, as well as papers on various aspects of ornithology.

Bulletins of news items, including the Society's *Newsletter* and the *Ornithological Bulletin*, are sent to members throughout the year.

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These are held in most weeks throughout the year, with lectures, discussions, colour slides and films on all aspects of natural history.

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Led by experts to visit interesting natural history localities, many outside our Area. These excursions are very popular with beginners wishing to increase their knowledge and enable members to get to know one another.

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The Membership Secretary, P. C. Holland,
Flat 9, Pinewood Court, 23 Clarence Avenue,
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THE LONDON NATURALIST

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Top. WHITE-LEGGED DAMSELFLY *Platynemis pennipes* (Pallas). Now restricted to a few slow-flowing rivers in outer London.

Bottom. COMMON DARTER *Sympetrum striolatum* (Charpentier). Common throughout the London Area and a frequent resident in garden ponds. Photographed by Ann Brooks.

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Geology

Records may be sent to the appropriate recorder or to Colin Plant who will distribute to each recorder the relevant data from a mixed set of records.

Requests for information should be made to the appropriate recorder.

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Report of the Society for 1988*

A Special General Meeting in May approved Council's recommendation to increase the annual subscription. This was the first increase for nearly ten years. The entrance fee was abolished at the same time.

The highlight of the year was the publication of the Society's illustrated book, *The Butterflies of the London Area*. It covers the histories, and past and present distributions, of 72 species and has been well received by reviewers. It stands as a testament to the work of its author, Colin Plant, to whom the Society expresses sincere thanks. Members can still obtain the remaining copies through the Society. Colin has not finished yet: work is now well under way on *The Moths of London*.

The *London Bird Report* for 1987 will be Andrew Moon's last as editor. We thank him for his five years in charge, during which time it has grown in stature as well as size. We also thank Lynn Patton for her three years as *Newsletter* editor and Charles Westwood for his ten as editor of the *Ornithological Bulletin*. Separate subscription to the *Bulletin* was discontinued during the year. We are pleased that Keith Hyatt has agreed to remain editor of *The London Naturalist* despite his intention to move away from London.

The main focus of ornithological field work during the year has been the B.T.O. New Breeding Atlas of Birds. The survey continues until 1990, and most of the Greater London area has received complete coverage in the first year. In parallel, an L.N.H.S. Breeding Bird Atlas was launched in April in order to update our own 1968-72 Atlas. Initial results indicate substantial coverage just in the first year: it is pleasing to note that Essex has achieved the best percentage cover so far in contrast to the difficulties in previous surveys. The Inner London Bird Survey was completed at the end of March. The results are now being analysed and will appear in a future *London Bird Report*. Active consideration is being given to what can be done to improve recording in Inner London.

As mentioned in last year's Annual Report, the Society donated £1,000 to the British Trust for Ornithology's appeal for a National Centre for Ornithology. However, the B.T.O. now intend moving to Thetford, in Norfolk, rather than relocating in Tring. The Society paid half of the cost of a tern raft at Stocker's Lake, Hertfordshire; the raft was used successfully by a pair of common terns which hatched three young. The Society has now formalised its Grants Policy, whereby it sets aside a small amount each year to assist conservation work, the establishment or maintenance of nature reserves and scientific investigation in the London Area.

The sections have again organised a full and varied programme of meetings. Attendance at Geology Section meetings has doubled. Some really worthwhile fossil finds have been made and these were mentioned in the *Newsletter*. Attendance at Botany Section meetings showed a decided increase. The Ornithology Section continued to maintain a balance between talks of general and more specialised interest. The Ramblers and Archaeology Section's mid-week meetings proved as popular as ever. The Ecology and Entomology Section's newsletter, *The London Atalanta*, has now been running for two years. It is used to record a good proportion of the section's meetings and affords the recorders the opportunity to keep members informed of this important part of the section's affairs. In June a dragonfly recording card was designed and issued to members. The South-West Middlesex Section had another successful year. The Bookham Common Survey has successfully continued for its forty-seventh year.

The Society has purchased a new projector for use at Burlington House. Despite some teething problems, this is now working satisfactorily and has certainly improved the quality of projection there. We thank Brad Ashby for the lengths he has gone to on the Society's behalf in connection with this.

*Presented at the Annual General Meeting, 7 December 1988.

It is with regret that we record the deaths of the following members: F. W. Blake, F. D. L. Burley, O. B. J. French, G. G. Geyman, C. A. Goodey, F. H. Jones, F. M. King and Miss H. M. Smith. Frank Blake was one of our longest-standing members, having first joined the Society in 1937. Frank Jones joined the Society in 1950 and was involved with the *London Bird Report*, either as editor or as a writer, for the last 35 years. Margaret Smith had been a member since 1952 and South-West Middlesex Section secretary for many years.

Membership intake this year, at 135, was the lowest for several years. The breakdown of the number of members at the end of September 1988 was as follows:

Ordinary	1,036
Family	133
Junior	18
Senior	97
Honorary	15
Life	8
Affiliated	18
Total	1,325

Our thanks go to all officers and sectional committees who work so hard for the Society. Thanks also go to Imperial College for allowing us the use of their rooms and to Mrs Czigany and her staff for the custody of the Society's library.

Society Grants

The Society sets aside a small amount each year to assist conservation work, the establishment or maintenance of nature reserves and scientific investigation in the London Area. Applications for grants and loans are considered by the Administration and Finance Committee: enquiries should be addressed to its Secretary. Papers reporting results of research supported in this way must be submitted for publication in the Society's journals.

Book Review

Keys to the Adults, Male Hypopygia, Fourth-Instar Larvae and Pupae of the British Mosquitoes (Culicidae), with notes on their Ecology and Medical Importance. By P. S. Cranston, C. D. Ramsdale, K. R. Snow and G. B. White. Freshwater Biological Association. Scientific Publication Number 48. 1987. 156pp., 138 text figures and a monochrome frontispiece. £9.00. ISSN 0367-1887. ISBN 0 900386 46 0.

Generally speaking, outside entomological circles the only insects of any interest to the ordinary man are the large, brightly coloured ones that can be seen either flying by day in sunshine or which are encountered in the evening as they penetrate the Englishman's Castle via an open window and proceed to fly in a most irritating manner around the light. Mosquitoes are the exception to this rule for, although beyond doubt falling into the category of 'little brown jobs' they have a notoriety unparalleled by any other living insect. Few readers will have avoided becoming a reluctant host to one of these troublesome pests at some time and naturalists more than most will be aware of the great discomfort that can be inflicted by a swarm of these small creatures on the way back to the car after a summer evening's ramble. They not only bite, but are also major vectors of disease. Most notable, perhaps, is malaria, now largely confined to the tropics but formerly a very common affliction in south-east England and in the Fens, where it was referred to as 'the ague'.

In view of the medical, and hence economic importance of mosquitoes it is surprising to discover just how little has been published on the British species. The first comprehensive guide appeared as late as 1920 in the form of *A handbook of British Mosquitoes* by W. D. Lang, published by the B.M.(N.H.). The 'classic' work on this group of flies followed in 1938 with J. F. Marshall's *The British Mosquitoes*, also published by the B.M.(N.H.) but no comprehensive revision had been produced since then until the present volume. Although some twelve years on, in 1950, P. F. Mattingley wrote the mosquito section in the Royal Entomological Society of London's *Handbook for the Identification of British Insects* (Volume 9, part 2: *Diptera 2, Nematocera*), this dealt solely with identification and added little to our knowledge of the insects themselves. This latter work has remained the only real means of identifying the British species for nearly forty years!

As with all the Scientific Publications produced by the F.B.A. in recent years this is a most valuable contribution to the literature. It is also far more than just an identification key and checklist; each species is also subjected to a thorough review of its biology, ecology, behaviour and medical importance. Though this family of flies falls outside my normal sphere of interest I found the keys easy and reliable when checked against known material and the extensive notes most enlightening. The illustrative material is clear, particularly the genitalia drawings.

It is hard to fault this work. I am a little mystified by the disappearance of *Stegomyia aegypti* (Linnaeus, 1762) which is present in the 1976 checklist published by the Royal Entomological Society (Kloet, G. S. and Hincks, W. D. *A Checklist of British Insects*, part 5, *Diptera and Siphonaptera*), but absent on the new checklist on pages 7 and 8 of the present volume. I know nothing at all of this insect but would rather like to know where it has gone to!

Apart from this minor point, the book is a work of excellence – as would be expected from such eminent authors. It will no doubt be of considerable use to field entomologists, medical entomologists and pathologists and others, though probably not of such interest to the general naturalist.

COLIN W. PLANT

Nature in Trust

by MICHAEL WILSDON

(Presidential Address delivered at the Annual General Meeting on 8 December 1988)

Introduction

At the end of the Presidential Address this time last year I stated that the next target for consideration would be the role of the County Trusts. This remained my aim for several months but, quite frankly, the target was far too big for me to handle. This left me without a particularly serious subject for this address and in my desperation I reviewed the earlier copies of *The London Naturalist*, but all I could find were serious scientific explanations. As I could not match years of recording butterflies or plants, I was somewhat at a loss.

Surveys

Whilst standing waiting to commence my normal daily commuter journey into London from Preston Park Station just north of Brighton several days ago, it occurred to me that the only regular, in fact monotonous, survey work I did was casual bird watching from the Brighton to London train. And from this rather humble base the rest of this talk, which examines the future of London and the South East, will grow.

On the very first daily return journey from London when I started commuting I was lucky enough to see two green sandpipers flying along a ditch by Holmethorpe gravel pits. I was rather impressed by this and assumed that subsequent journeys would have similar success. In fact, there has been really very little return for the hours put in. This, I think, is due mainly to the lack of any open water, reservoirs, etc., and thus the reduced number of likely species to be seen.

There are a few rather puzzling matters which I would hope that someone can yet explain to me. The first concerns two corvid species that I would wish to compare, namely the magpie and the jay. While I have a rough idea of the total number of likely pairs of magpies resident on the trackside, I have never been able to work out any similar details with respect to the jay. For weeks one hardly sees a jay and then suddenly, in a period of two or three days, five or so may be seen from the train. Relationship between the casual sightings and the total population remains, for me, pure guesswork. According to the *Winter Atlas* the December population for Britain and Ireland seems likely to be 350,000-400,000 birds, while there is a greater range for the magpie with figures of 250,000-500,000. Also, the range of habitats for the magpie for the Surrey and London part to my journey would favour that species. However, even excluding those areas and the areas immediately north of Brighton which are between two large roosts (jointly up to 100 birds in mid-winter), it is the usual scarcity and occasional abundance of the jay that leaves me so puzzled in what is otherwise a fairly accurate random sampling technique.

The only species for which I have any worries are the grey and red-legged partridge. I have never seen either species from the London to Brighton line. While this may be due purely to bad observation since there are certainly red-legged partridges fairly close to the track immediately north of Brighton, and since also I have seen them close to Lewes, these were always species that I used to consider would first be seen each new year on an early train or car journey.

So far, I have painted a rather bleak picture which is perhaps unfair. Ring-necked parakeets can frequently be seen flying over Preston Park, presumably moving from their Hollingbury stronghold across to Hove. Last summer I had

excellent views of a black redstart while waiting outside Blackfriars Station. In fact, the last hoopoes and woodchat shrikes were also seen from trains but not, I regret, in this country.

There are a few other slight quirks, such as that while kestrel and sparrowhawk seem at about equal numbers where I live, kestrel sightings are by far the greater from the train. This I would put down simply to the differences in hunting techniques.

Local Habitats

There is at least a history of discussing birds from trains. Richard Jefferies, referring to his journey to Brighton in 1880, discusses the red-backed shrikes by Clapham Junction! To provide another link between Sussex and London, the best description I have ever read of magpie behaviour comes from W. H. Hudson, when he describes the behaviour of a flock of magpies near Midhurst.

Now rather than detail more similar sightings in the London area, I will quite frankly recommend that you read one of the current books such as *Wild In London* by David Goode. Personally, I can state that his remarks as to foxes are completely true. For two weeks in May and June this year (1988) I saw one to three foxes every day as they were walking or playing by the trackside. Nearly all of these were in south London with the occasional sighting in the wastelands near Three Bridges (Crawley). The only thing I would note is that at both ends of the journey there are continual signs of slow and quiet encroachment. Residential homes for the elderly and blocks of flats quietly snip away at the edges of the green corridor of the railway into Brighton, while more offices, shops and warehouse-style stores appear in the London suburbs. In both cases the wasteland or green links are destroyed. I suspect that it is the casual encroachment that is leading to the decline of local tawny owls since, within five years, this species seems to have declined in the north of Brighton. Hopefully, I am just wrong as to the decline, but irrespective of the October 1987 storm damage, there is considerably less woodland.

London and the Future

This Society has in recent years been producing larger, glossier and simply better bird reports than ever before. The area is better watched than it ever was before and yet significant areas are under threat.

Rainham Marshes

If I may thank the N.C.C. for the following outline, the position is roughly as follows. The marshes were at their maximum extent from about 1775 to 1935. In the mid-1870s there was some development along the Rainham Creek. From 1935 to 1988 there has been the development into the current two blocks of marsh. In the period 1968 to 1972 the dredging tip and industrial encroachment began. Now with the new route for the A13, plus more industry, plus a further dredging tip area (with only mud fill and no water), this S.S.S.I. is under considerable pressure. The main strategic planning authorities do not see a nature conservation role for the site, while invertebrate surveys show the site to be of extreme interest. There is perhaps a chance of the London Borough of Havering allowing the London Wildlife Trust a reserve south of the new A13. However, the claim for Rainham Marsh is that it is a last remnant of grazing marsh within the area and it will be extremely difficult to maintain this reserve as a grazing marsh. There will be problems of drainage, the quality of the water allowing for the local industrial sites and exactly how any grazing will be feasible without motorised cattle.

The problem of grazing marshes along the Thames is a similar sad story of development pressure. The latest N.C.C. surveys show that at minimum some 60% has gone in the last four to six years; also the surveys have shown that the

individual grazing marshes are different from each other and that you cannot say that one may be retained as a specimen for all grazing marsh types.

At the current rate all grazing marsh areas will have gone by the year 2002 for London, 2005 for Kent and 2018 for Essex. Once developmental pressures succeed then the decline or exploitation of the areas is very quick. As an example, half of the 1981 areas for Erith/North Kent marsh areas outside the S.S.S.I. had been lost by 1988. The changes in Kent have been due mainly to the conversion of grazing march to arable land, whereas urbanisation has been the main cause in London and Essex. The greatest proportional decline has in fact occurred within the London area where 71% of the grazing marsh recorded in 1935 has now been lost. Also, by the fragmentation of the remaining sites, it is both easier for the sites to become targets for development and also easier for the sites to degrade without any form of management.

Barn Elms Reservoirs

With the changes coming to the London Ring water main there is no need for Thames Water to retain the Barn Elms Reservoirs. This has become an exercise in local politics and it is perhaps to be hoped that The Wildfowl Trust will take part of the site. While any London base for The Wildfowl Trust is to be welcomed, since this will naturally increase their membership and revenues and thus further their excellent work, there will still be a loss overall at the site if only because hardly anyone will wish to be responsible for a series of large reservoirs when they do not have the manpower or capability to look after them. Thus, part of the site will presumably become building land in an area where this will command a very high premium. At the end of the day the local people may win or lose, but London overall will lose a prime site. Whether nationally that will be a disaster may depend on the success of The Wildfowl Trust in its other efforts.

Stoke Newington

In a similar manner to Barn Elms, Thames Water has a lesser need for the Stoke Newington Reservoirs. Again, plans have been put forward for development of all bar one reservoir, thus freeing a considerable area for building purposes. Several years ago Thames Water came up with the imaginative idea of setting up a Thames Water Development Trust Fund which would be able to provide capital for conservation measures on old T.W.A. sites and also able to buy the sites outright. This circumvented the problems that virtually no conservation body would have anything like the monies available for purchasing a prime London site. Unfortunately, there was no further development of this idea, or at least I am unaware of any such development. The requirement that the water authorities achieve the best return for their land would probably have negated any such proposals.

Oxleas Woods/Staines Reservoirs, etc

There are a variety of road and other schemes all threatening important sites in London so that it seems that hardly anywhere is left apart from a few of the larger Royal or similar parks. If the large water reservoirs are retained there is always the continual problem of simple physical access – the old rows of seven-foot fencing around Staines Reservoirs. I am not too certain whether we should be too critical though of Thames Water Authority who have certainly had an understanding of conservation matters. It is yet to be shown whether the French water companies such as the Compagnie Générale des Eaux (C.G.E.) and Société d'Aménagement Urbain et Rural (S.A.U.R.) will share those same concerns. The initial impression from reservoirs such as Abberton have not been favourable. As the Government proposes to transfer the actual assets of the water authorities rather than run a mere leasing system, these companies are in a very powerful position in the future to influence conservation, access and general amenity value.

Intangibles

The various books on wildlife in London tend to dwell very much on the urban scrub and wasteland together with the Royal Parks and reservoirs. As we have seen the reservoirs are under new review and many of the urban woodlands etc. are also under threat either of encroachment or general mismanagement. As to the wasteland areas, these are frequently owned by the large concerns such as British Rail or the London Electricity Board. When the day comes that these bodies are privatised, the land they hold which is not producing any valuable income will presumably be freed to provide a more commercial return. The wastelands may be very nice, albeit perhaps unsightly, but there is no reason, considering the pressure for housing and factory development, that they should remain wastelands for very long. The development north of King's Cross would not have appeared an immediate threat some years ago and it is probably worth considering local areas without the natural presumption that nobody could be bothered to touch that appalling piece of land.

As to the wider matter of water privatisation, it has taken this and other local societies a long time to build up rapport with such bodies as Thames Water. If that body is split with half the appropriate conservation scientists transferred to the new river authority there will be again another period when contacts have to be re-established and the needs of the conservation minded taken into account rather than the pure engineering requirements of water provision and sewage disposal.

The Voluntary Sector

In all the above examples it does seem that the main forces are against the London naturalist. Everywhere he or she looks there is a potential threat. The variety of organisations such as the local Urban or County Trusts, R.S.P.B. or National Trust that wish to acquire and preserve land are all, in a sense anyway, competing for membership subscriptions and it is very much in that light that the council of this Society argued so long over the last increase in subscriptions. The main lesson from the loss of grazing marsh appears to me to have been the ease with which small sites were acquired for development and then once one development had occurred the acquisition of further and then further neighbouring sites. Frequently an access road would be built and then development applied for a few years later. The local nature reserve is then isolated, may then well decline so that everybody can say it was not really worth preserving. The only way this can be overcome is the purchase of large areas of land which are not worth considering for development because the main access routes just do not exist. However, it is also in the most expensive area of the country for land prices.

I think that it is this acquisition and correct management of land that is the most important test against which we can judge the local Trusts and the larger national bodies. Thus, however twee the R.S.P.B. Catalogue may be, all praise to their skill and tenacity at acquiring land and looking after it. I hope they are successful with their next West Sussex purchase as the Arun Valley would be an ideal area for more nature reserves before the south coast roadways are upgraded to motorway status. I think similar praise is due to the Wildfowl Trust and in the main the county and other organisations. It is just the feeling that there is no coherent planning covering the whole south east of England which is probably under greatest threat, or, to be quite cynical, no planning to purchase areas outside the south east on the grounds that that area may as well now be forgotten. In part, such conflicts may be put down to the need to raise money and also, especially in the case of the urban Trusts, the aim to change general awareness to matters environmental. In all honesty, such a plan with prioritising the worthwhile sites and then acquiring them should be a Government function, if only as necessary for local structure plans. Whether

the voluntary sector would have to stump up the cash is a separate matter. By putting the argument in the context merely of threats to wildlife areas I have avoided the question of whether the usage should be either broadly for scientific study and research or very broadly for recreation purposes. If there is no land which does not have a do-it-yourself store upon it then the matter is irrelevant. However, this needs to be thought through, especially by the County Trusts, for there are already worrying signs that certain major developers would wish to offer a well-nigh standard identikit nature reserve as part of their major developments and that this might seem financially attractive. But it is the diversity of sites and preservation of that variety and interest that is of prime importance. However, by definition, virtually all the voluntary sector has limited funds even if they are asset rich. It is perhaps a pity that The National Trust, which is after all the country's largest private landowner, has for so long ignored any responsibility towards places of national beauty. Considering all our talk of development there is something attractive in the inalienability of the Trust land. Admittedly, for that to be successful in the future, any land acquisitions would have needed not to have had prior notifications of any development for the inalienability clauses to work. To quote from the most enjoyable work by the late John Gaze:

'Four main areas of concern: open spaces, nature conservancy, the preservation of archeological sites and the fate of historical buildings all emerged during the first quarter of this century'.

The nature conservancy aspect has lain dormant until the very last few years. Yet, up to the 1920s, there was a reasonable chance that The National Trust would take on the role, later undertaken, after a 30-year gap in the majority of counties, by the local County Trusts and thus acquire and manage areas even if there was not easy public access and enjoyment. The failure of the Society for the Promotion of Nature Reserves at the same time between the two wars was put down by Max Nicholson to the untimely death of Charles Rothschild. Nicholson also noted that the executive was over-weighted with entomologists which I am fairly sure does not affect this Society! It is perhaps because The National Trust did not pursue matters, while the only Trust to have really commenced action before the Second World War was the Norfolk Naturalists', that it had taken so long for coherent action. The selection of national nature reserves after the Second World War and the subsequent listing of various sites under various headings has all been worthwhile, but has probably been simply too slow, under-funded and ineffective to cope with current developmental pressures.

Conclusion

To refer back to the title 'Nature in Trust', the London area has a considerable number of threats to its main and most enjoyable wildlife sites over the next few years. This Society has a role in providing the records to show that the sites are valuable as well as continuing its more recreational role in showing members the fauna and flora of the London area. The Society must also continue its pressure to ensure that the conservation bodies continue their land acquisition albeit preferably with some form of overall and coherent strategy so that the major wildlife sites are both accessible and safe.

The following works were consulted during the preparation of the above talk and are well worth reading: —

1. *Figures in a Landscape: a History of the National Trust*. By John Gaze. 1988. Barnie and Jenkins/National Trust.
2. *Wild in London*. by David Goode. 1986. A Shell Book/Michael Joseph. London.
3. *The Bird of Time*. By N. W. Moore. 1987. Cambridge University Press.
4. *The Environmental Revolution*. By Max Nicholson. 1970 (also later edition). Hodder and Stoughton.

Book Review

Brambles of the British Isles. By E. S. Edees and A. Newton. Edited by D. H. Kent. 377pp. £50.00. Ray Society, London, 1988. ISBN 0 903874 20 2. Obtainable from The Ray Society, c/o British Museum (Natural History), Cromwell Road, London SW7 5DB.

Batologists have long needed a reliable modern guide to British brambles, having only had the excellent but long out-dated work by Rogers (1900) or the unsatisfactory account by Watson (1958) to assist them. This book fulfills that need and does it handsomely. It contains a detailed account of over 300 species, which whilst not complete – the authors suggest over 500 taxa may be present in the British Isles – includes all those that are widespread or show a marked geographical distribution.

Hard-backed and printed on good paper a great deal of thought has clearly been given to the presentation of the necessarily highly detailed information the book contains. Here almost for the first time are complete, accurate and comparable descriptions of each species. Even more remarkably there is a set of keys to sections, subsections, series and species which appear to work well. Great care has been taken to ensure the correct application of all the names employed (Watson's work has become notorious for its misattribution of the names of Continental plants to British brambles) and this should help to ensure a stable nomenclature for the future. Each species account includes a summary of its vice-county distribution, ecology and distribution type. This is followed by an invaluable paragraph highlighting the diagnostic characters, although anyone using these accounts should never neglect to compare their specimens carefully against the full description. The latter are notable for their precise description of hairs, glands and stem armature.

Up-to-date 10 km square dot distribution maps are given for the majority of the species and there are illustrations of almost a hundred. The latter take the form of black and white photographs of well-prepared herbarium specimens, usually with inset enlargements of stem and panicle pieces; these are the only slightly unsatisfactory aspects of the book as their reproduction in many cases is not as crisp and clear as it should be. Nonetheless they are a useful part of the whole account.

This book makes a difficult group accessible to the amateur, although no-one should go away with the idea that this is 'brambles made easy'. There will be plants encountered that are not included and experience is needed to recognise the variability that can arise from different conditions of soil, shade and climate. The authors and editor are, however, to be congratulated on doing everything they might reasonably have been expected to in order to help the aspiring batologist. It will quickly come to be regarded as a classic of its kind.

A. C. LESLIE

Further Studies of Plant Groups in Kensal Green and St Mary's Cemeteries, 1983-1989

by J. B. LATHAM*

Summary

Between 1983 and 1989 a second survey of the flora of Kensal Green Cemetery in north-west London was carried out. This resulted in a large number of species records additional to those made from 1981 to 1983. The opportunity was taken also to record the lichens, mosses and fungi. The results complement the initial survey (Latham 1984).

Introduction

The original survey of the flora of Kensal Green and the adjoining St Mary's Catholic Cemetery was carried out during the years 1981 to 1983 and appeared in Latham (1984). The cemetery is of special importance in being the earliest in London, having been consecrated on 24 January 1833.

In the period 1983-89 a further study of the flora of Kensal Green Cemetery was made, resulting in a large number of additional records. Over the same period the lichens, mosses and fungi of the area were studied intensively. The results of these researches are set out in this paper and the sites may be identified in Figure 1.

Since my last paper some plant species have been lost from the site, but they were all of casual status and their loss, therefore, does not indicate any major habitat alteration. They include *Herschfeldia incana*, *Digitalis purpurea* and *Hesperis matronalis*.

Bird-seed aliens sometimes spring up by paths from seed scattered by visitors. These records have been excluded from the present survey as being historically irrelevant to the flora.

The nomenclature follows Clapham *et al.* (1962) for flowering plants, Dobson (1979) for lichens, Bon (1987) for fungi and Corley *et al.* (1981) for mosses.

The Flora

Damp clay pasture is the most important habitat in Kensal Green Cemetery. *Valeriana officinalis* and *Polygonum bistorta* are recently discovered additions to the characteristic flora of this habitat, although both are scarce and neither has yet (January 1989) been seen in flower. In the case of the former, an early grass-cutting regime may inhibit flowering in most years. A drier, calcareous grassland is found mainly in the north of the site. *Clinopodium vulgare* and *Leontodon hispidus*, growing by North Avenue, are typical constituents of the flora here.

Naturalised cultivars continue to make up a substantial part of the flora and are of widely varying status. *Iberis amara* is a popular planted ornament of graves and frequently comes up from seed in areas of disturbed ground. The vintage cottage garden roses 'Dorothy Perkins' and its close relative *Rosa* 'Excelsa' have been competing vigorously with the indigenous *R. canina* for many years in the wilder parts of Kensal Green. But unlike the wild rose, they spread mainly by vegetative means. It is impossible now to trace where they were originally planted. *R.* 'Excelsa' is notable for its infrequent flowering. The crimson blooms must be carefully searched for amid the deep herbage where the plant usually occurs. It is a trellis climber and, in the absence of bushes or other trellis substitutes, heavy shading undoubtedly inhibits flowering in the naturalised state. On the other hand 'Dorothy Perkins' flowers abundantly at

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the same season as it makes full use of the thick growth of brambles by North Avenue where it mainly occurs.

A conspicuous feature of the cemetery is the wide scattering of anciently planted trees which have failed up to now to propagate themselves by seed and hence significantly to extend their range. Often standing in neglected situations they are monuments to forgotten landscape gardeners and foremen who successively left their mark on the cemetery and in so doing contributed to its overall botanical diversity. These trees comprise, typically, alien species or hybrids. Some of them appear so much part of the predominantly semi-natural vegetation that it is hard to be sure if they were indeed originally planted or came up by some natural means. *Malus floribunda*, at the edge of a dump and practically enclosed by naturalised 'weed' sycamores, is a case in point. However, all must be assumed to have been planted until proven otherwise. They are noted as a supplement to the flora under section II. Plantings of more recent date (*i.e.* under forty years old), are generally found in the newest, well tended areas and cannot lay claim to be part of the historic flora of the site. They are excluded from this survey.

Indiscriminate spraying of open grassland in the disused parts of St Mary's Roman Catholic Cemetery continues drastically to reduce its botanical interest. So that it is likely *Achillea ptarmica* and *Pimpinella saxifraga* (Latham 1984 species list), are now extinct in the area. Repeated applications kill the grass, leaving unsightly bare patches of soil which are soon colonised by opportunist mosses such as *Funaria hygrometrica*. In some years upward spray drift strikes the low hanging branches of specimen trees such as *Platanus* $\times$ *hybrida*, poisoning and distorting the lowermost leaves. Against this annual assault, however, the relict *Sedum* and *Cladonia* communities of old slab graves are remarkably immune. Although never directly sprayed, they are unaffected by the inevitable spray drift.

The tip, to the east of the cemetery, with its successive applications of seed impregnated topsoil, used to display, annually, an interesting crop of arable weeds (Latham 1984). A few years ago this area was levelled and grassed over for the reception of new interments. Botanically, therefore, it is of no further interest. The present survey records the last of this crop before the transformation. Interesting species may still be found on the sandy, rough ground near an adjacent newly erected greenhouse. *Chenopodium opulifolium* and *Papaver dubium* were found recently here.

Lichens and Mosses

A diverse lichen flora has colonised the extensive areas of worked stone in the cemetery. These areas comprise not only walls and grave surfaces, but the pavements of the Anglican chapel and crematorium.

Undoubtedly Kensal Green, retaining as it does a semi-rural aspect, is lower in air pollution than the surrounding heavily built-up areas. A moderately pollution-sensitive species such as *Xanthoria parietina* which, when growing on stonework, is generally reduced to a fragmented state in an inner urban environment, attains optimum development in the cemetery.

It is one of the nitrophilous lichens which forms dense communities on the exposed tops of limestone headstones where perching birds have enriched the surfaces with their droppings over many years. The community is also well developed on low walltops of the crematorium gardens where mixed *Physcia caesia*, *P. grisea* and *P. orbicularis* form continuous mats.

The newer headstones of white or black polished marble are inhospitable to the growth of higher lichens and have not extended the range of species (Laundon 1967). Bird droppings lie as unsightly stains on these surfaces.

A limited but diverse invertebrate fauna utilises the lichen cover of worked

stone in the area. The zebra spider *Salticus scenicus* and micromoth larvae of the family Psychidae, inhabit these surfaces for camouflage (Emmet 1979). These larvae and various species of mite also feed on the lichen usually without doing any permanent damage, but the mite *Ameronothrus maculatus* is a threat to the relict lichen, *Caloplaca decipiens*, in the area. It eats away the thallus leaving only the surrounding lobes as may be observed on a chest tomb of the 1860s where the lichen abounds. Probably it also uses the lichen for shelter (Laundon 1967). The mite also feeds on non relict species of lichen to which it poses no threat as they can renew themselves in time.

In the area *Caloplaca decipiens* attains its greatest frequency on limestone memorials of the 1860s and thereafter declines in numbers until by 1900 it is extinct. Graves of this date are usually so weather worn that the inscription has been obliterated and the date of the grave can only be estimated to within a decade by reference to surrounding memorials of similar style where the year, at least, of the interment is still decipherable. The decline of *C. decipiens* charts the rise in the levels of air pollution which occurred in this part of Middlesex over the period due to increasing urbanisation around the cemetery (Latham, 1984).

Fortunately for lichen and moss conservation the destructive practice of tomb cleaning is not widespread in the cemetery. It has been confined to military graves of the two world wars and a few memorials to family or national celebrities. The grave of Mary Hogarth, wife of Charles Dickens, is an example by North Avenue. The unsightly effects of the cleaning of old chest tombs are graphically shown in the churchyard of All Saints, Fulham.

Outside of semi-heathland habitats like Barnes Common, the city churchyards and necropoli are now probably the main havens for terricolous lichens in London. They mainly comprise various species of *Cladonia* in the area.

Associations of *Cladonia* and *Bryum* mosses are common. Typically they grow lying detached on the plain limestone or marble chip substrates surrounded by kerbstones which has come into general use this century (Latham 1984). Sometimes *Bryum* is replaced by other species of xerophilous moss. On a couple of slabs in the central area *Cladonia* is found forming an equally loose association with the alien moss *Campylopus introflexus*. The discovery of this moss at Scrubs Wood in 1984 was only its second record for Middlesex (London Wildlife Trust 1984).

Peltigera in Kensal Green is more selective in its habitat and hence rarer. Like *Cladonia* it is found on exposed, nutrient-poor substrates, but it can only grow anchored to the soil. Hence it is found on a few old marble chip graves where a thin layer of soil and mosses has built up over the years. The rootlets of the mosses penetrate through the soil and tightly bind the marble chips together to make a firm nutrient base as is seen by pulling up one of the tufts.

This type of grave has created a fragmented community of dry, open habitats which remain, in the plants and wildlife they support, quite distinct from the surrounding lush grassland. Typical plants of the heath grave, as it may be called, include *Geranium rotundifolium*, *Trifolium dubium* and *T. striatum*. Solitary wasps like to nest in holes dug between the moss-covered marble chips and can be watched flying in and out.

The heath community attains its best development on graves from the late 1940s to the mid 1950s, but a good early example is the Ferryman grave of 1937, the earliest known site for *Peltigera didactyla* (*P. spuria*).

The moss *Bryum bicolor* also demands an open habitat. But it seems to be more common on gravel paths than on graves in the area. It is abundant along the narrow strip of stunted vegetation which lies between twin tyre tracks in North Avenue.

The lichen flora of the area growing on wood is relatively poor, reflecting the

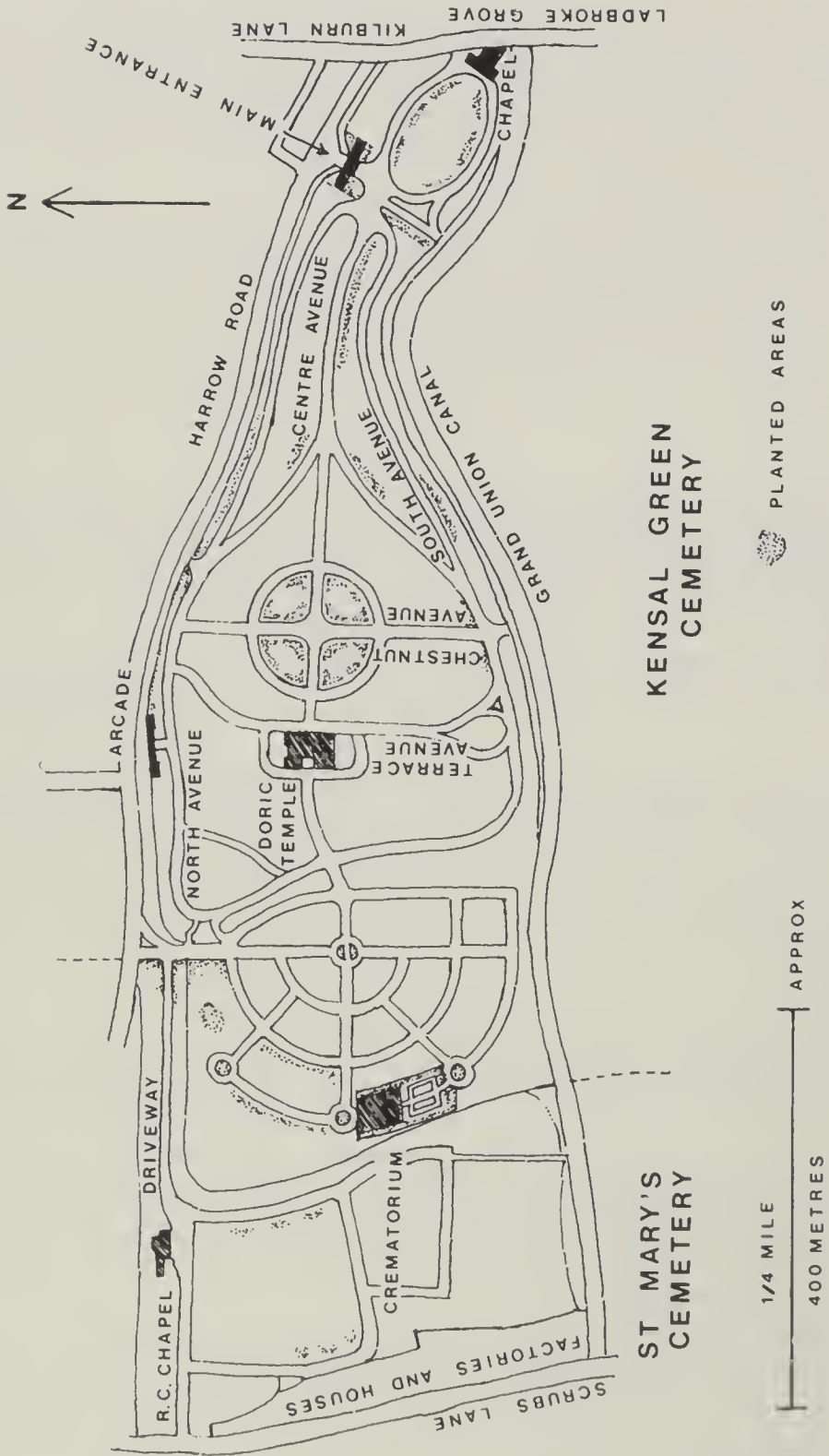


FIG. 1. Kensal Green and St Mary's Cemeteries.

position over London as a whole where a few pollution-tolerant species are exclusive colonists of bark. *Lecanora conizaeoides* is perhaps the commonest species. In the Royal Parks, modern cemeteries and other areas where trees stand isolated in mown grassland, *L. conizaeoides* is confined to the bases of the boles (Laundon 1967). However, the thick shrub layers in Kensal Green maintain a greater overall humidity which enables the species to ascend much higher up the bole, sometimes to approximately six feet in the central area.

Fungi

Although fungi may be found over the whole site, certain areas are particularly rewarding. These are the large lawn west of Oxford Avenue, known as the western lawn, the narrow strips of secondary woodland by North and South Avenues, the southern grass verge by Centre Avenue and the zones of deep leaf litter which have built up under old planted holm oaks by central paths. *Leccinum duriusculum*, a nationally uncommon species, grows in the vicinity of young planted *Populus alba* trees on the western lawn. The two species appear to be mutually interdependant (Bon 1987).

Fallen wood and tree stumps are generally left to decay in the cemetery which has led to an impressive array of the fungi restricted to this habitat. The resource has been recently added to by the hurricane of October 1987 which toppled a number of overmature timber trees, the main victims being poplar and beech. The fallen trunks are being sawn into logs and both *Stereum purpureum* and *S. hirsutum* have dramatically extended their ranges by colonising the sawn surfaces.

Chestnut leaf litter is generally inhospitable to most species of fungi, but *Agaricus silvaticus* and *Clitocybe nebularis* may regularly be found under the mature trees lining Chestnut Avenue.

If the substrate where they occur is left undisturbed many species of fungi will recur in the same place year after year. Examples are *Inocybe geophylla* on a verge by Centre Avenue and *Pholiota squarrosa* which has reappeared at the



FIG. 2. The fungus *Pleurotus ostreatus* on the trunk of a dead silver birch *Betula pendula* in Kensal Green Cemetery.

base of an old ash tree by Centre Avenue every year since at least 1982. Other species, especially small cup-fungi of waysides, are unpredictable in their appearance and may recur in different places each year. Unfortunately many fungi species of grass verges are under threat from the encroachment of new graves on their habitat. This is especially true of recurrent species which are known from only one or two sites.

I. Vascular plants recorded from Kensal Green and St Mary's Cemeteries during the years 1983 to 1989

Locations are given by reference to named paths and topographical features as shown in Figure 1.

All the plants in this section are native or naturalised species having historical connections with the site. The term 'naturalised' in this context includes long-established herbaceous cultivars which have gradually extended their range by vegetative growth over the years, but which remain confined to the sites where they were originally planted. They are designated as 'relict' in the species list; they are most common as grave plantings.

Abbreviations: KG – Kensal Green, SM – St Mary's Cemetery.

ANGIOSPERMAE: DICOTYLEDONES

Ranunculus scleratus celery-leaved buttercup. On a muddy grave by South Avenue.

Papaver dubium long-headed poppy. On sand near SM tip. Scarce.

Cardamine flexuosa wavy bittercress. Common on damp soil.

Rorippa microphylla one-rowed watercress. Scarce by North Avenue.

Arabis caucasica garden arabis. Relict on a grave of 1962 east of the main entrance.

Iberis amara garden candytuft. Occasionally naturalised from seed.

Hypericum hirsutum hairy St John's wort. Scattered in species-rich grassland west of the Doric (Anglican) Temple.

Viola reichenbachiana early dog violet. Uncommon north of Centre Avenue.

Silene vulgaris bladder campion. A casual on sand near SM tip. Not seen in recent years.

Cerastium glomeratum sticky mouse ear. Common on dry paths and graves.

Arenaria serpyllifolia thyme-leaved sandwort. On marble chips of a recent grave by SM driveway.

Chenopodium opulifolium grey goosefoot. On sand near SM tip.

Geranium pratense meadow geranium. Scattered in grassland NW of Centre Avenue. Apparently a true native in KG.

G. himalayense Himalayan cranesbill. Naturalised at one site by Cambridge Avenue. It may have been anciently planted nearby.

G. iberica Iberian cranesbill. Relict on a 1950 grave.

G. columbinum long-stalked cranesbill. Now well established on a few old heath slab graves by SM driveway. Not originally planted.

G. rotundifolium round-leaved cranesbill. Largely confined to old slab graves west of the Doric Temple.

G. lucidum shining cranesbill. Scarce by North Avenue.

Rosa sp. 'Dorothy Perkins'. Naturalised and climbing bushes by North Avenue. Introduced to horticulture in 1901.

Rosa sp. 'Excelsa'. Widely naturalised in grassland. Introduced to horticulture in 1909.

Trifolium striatum soft clover. On two old heath slabs by SM driveway.

Sedum spurium Caucasian stonecrop. Relict on many old ledger graves, often spreading vegetatively to cover the whole slab.

Oenothera erythrosepala large-flowered evening primrose. Casual. Not seen in recent years.

Euphorbia helioscopia sun spurge. Common on disturbed ground.

Conium maculatum hemlock. Fairly common in rough ground. Also on SM tip.

Daucus carota wild carrot. Uncommon on SM tip.

Polygonum bistorta bistort. South of Centre Avenue. Rare.

Scrophularia nodosa figwort. Uncommon south of Centre Avenue.

Veronica agrestis green field speedwell. In short grass by SM driveway.

V. longifolia garden speedwell. Naturalised in grassland in SM but not seen in recent years.

Galeopsis tetrahit hempnettle. Casual on a grave by South Avenue.
Clinopodium vulgare wild basil. Uncommon in dry grassland in the north of KG.
Myosotis hispida early forgetmenot. On an old heath slab by SM driveway in 1984, but not seen since.
Valeriana officinalis valerian. Scarce in species-rich grassland west of the Doric Temple.
Lonicera japonica 'Halliana' Hall's honeysuckle. Long established on an old monument north of Centre Avenue, but never flowering.
Senecio viscosus sticky groundsel. On a path by the western boundary wall of KG. Casual.
Leontodon hispidus rough hawkbit. Scarce by North Avenue.
Picris hieracioides hawkweed oxtongue. Scattered in grassland.

ANGIOSPERMAE: MONOCOTYLEDONES

Muscari neglectum grape hyacinth. Characteristically relict on old slab graves, notably by SM driveway.
Allium paradoxum few-flowered leek. Scarce in grassland.
Iris spurium. Relict by a couple of old graves, one dated 1890.
Crocus aureus yellow crocus. Scarcely naturalised in grassland by paths.
C. tomasianus. Scarcely naturalised in grassland.
Crocus × *crocusniflora* montbretia. Increasingly naturalising from grave plantings.
Juncus inflexus hard rush. Scattered in grassland south of Centre Avenue.
Carex hirta hairy sedge. In grassland NW of the Doric Temple.
C. spicata spiked sedge. Uncommon in grass by paths.
Hordeum secalinum meadow barley. Scarce in the west of KG.
Deschampsia cespitosa tufted hair grass. Common.
Avena flavescens yellow oat. Scarce by paths.
Phleum bertolonii smaller cat's tail. Uncommon on the western lawn.

II. Old planted specimen trees which have failed to extend their ranges

Larix decidua larch. One tree near the junction of South and Chestnut Avenues.
Chamaecyparis lawsoniana Lawson's cypress. One tree north of Centre Avenue.
Taxodium distichum swamp cypress. Several trees in the north of the site. By paths.
Thuja plicata western red cedar. Two adjacent trees immediately SW of the Doric Temple.
Thuja orientalis Chinese thuja. One tree north of Centre Avenue.
Salix babylonica weeping willow. Several trees in St Mary's.
Castanea sativa sweet chestnut. Two widely separated trees, one at the junction of South and Chestnut Avenues. Both suckering.
Pyracantha coccinea pyracantha. One tree west of the Doric Temple. Scattered birdsown seedlings never survive long.
Crataegus × *media* hybrid hawthorn. One tree west of the Doric Temple.
Quercus petraea durmast oak. One tree by North Avenue. Vigorously suckering and perhaps producing seedlings locally.
Quercus hispanica Spanish oak. One tree by South Avenue.
Crataemespilis grandiflora hybrid medlar. One tree SW of the Doric Temple. By a path.
Platanus × *hybrida* London plane. Common in St Mary's.
*P. orientalis** Oriental plane. Many trees in the central area of KG. Suckering freely.
Malus floribunda† One tree by South Avenue. Annually flowering but never seen in fruit.
Catalpa speciosa Indian bean. One tree near South Avenue.

III. Flowerless plants of Kensal Green Cemetery

Notes – Heath and limestone ledger graves are collectively denoted as 'ledger graves'. Hollowed graves infilled with soil for memorial plantings are referred to as 'garden graves'.

It takes approximately ten years for the average grave to become covered with vegetation, beginning with moss tufts and creeping grasses invading from the surrounding sward, culminating in terricolous lichens and flowering plants. Garden graves frequently become mini lawn habitats colonised by mosses of grassy places.

*Erroneously described as *P. × hybrida* in my original paper (Latham 1984).

†Erroneously described as *M. domestica* in my original paper (Latham 1984).

MOSSES

- Atrichum undulatum*. Uncommon in woodland by South Avenue.
Polytrichum formosum. On ledger graves especially east of the main entrance.
Fissidens taxifolius. On bare clay patches, especially on ant hills.
F. exilis. Scattered on bare clay. Often growing with *F. taxifolius*.
Ceratodon purpureus. Common on ledger graves.
Campylopus introflexus. Rare on limestone slabs.
Tortula intermedia. Common on grave tops.
T. muralis. Abundant on grave tops and walls.
Phascum cuspidatum. On a clay bank NE of the main entrance.
Barbula convoluta. On bare patches of soil in many situations.
B. unguiculata. As previous species.
Schistidium apocarpum. Common on grave tops.
Grimmia pulvinata. As above. Also on wall tops.
Funaria hygrometrica. Common in burnt and sprayed places.
Leptobryum pyriforme. A common colonist of old flower pots left on slab and garden graves.
Bryum caespitiicum. Common on grave- and wall-tops.
B. argenteum. As above. Also on paths.
B. capillare. As above.
B. bicolor. On paths.
Mnium undulatum. On a lawn of a family vault by Centre Avenue.
Orthotrichum diaphanum. Scattered on gravestones and pavements.
O. anomalum. Common on old limestone slabs in the west of KG.
Amblystycium riparium. In stagnant water of a water tank by North Avenue.
Amblystegium serpens. Common on shaded graves and on the ground.
Homalothecium sericeum. Common on vertical sides of graves.
Colliergonella cuspidata. Common in grassy places.
Brachythecium albicans. As above.
B. rutabulum. Common. Typical habitat: at the base of a chest-tomb.
B. velutinum. Common on slab graves and on fallen branches.
Eurlynchium praelongum. Common on the ground in woodland, and on graves.
E. hiaris. Bare places.
Rhynchostegium confertum. On shaded graves and on the ground.
Scleropodium purum. Common in grassy places.
Rhyidiadelphus squarrosus. As above.

LIVERWORTS

- Marchantia polymorpha*. Common in bare places. Typical site: between paving stones of the Doric Temple.
Lophocolea heterophylla. On an elder stump in the SW of KG.
L. cuspidata. Common on damp twigs and clay banks.

LICHENS

- Collema* sp. Scarce on old monuments.
Caloplaca citrina. On walltops and chest-tombs.
C. saxicola. On calcareous headstones of the 1970s in the west of KG.
C. decipiens. Relict on old graves mainly in the north of KG.
Candelariella medians. Scattered on graves.
C. vitellina. Abundant on stonework.
C. aurella. As above.
Cladonia coniocraea. Fairly common on ledger graves. Among mosses.
C. chlorophaea. Uncommon, usually on heath graves.
C. fimbriata. The commonest *Cladonia* on ledger graves. Also more rarely, on mossy headstones and fallen wood.
C. squamosa. Scarce on a few ledger graves.
Hypogymnia physodes. Common on headstones and dead wood.
Aspicilia calcarea. Common on wall-tops and chest-tombs.
Lecanora muralis. Ubiquitous on graves, paths, wall-tops and pavements.
L. dispersa. Ubiquitous on stonework.
L. conizaeoides. Common on bark.
Lecidea fuscoatra. Common on siliceous stonework.
L. coarctata. Common on shaded chest-tombs and monumental graves.
L. lucida. Common on walls.
L. stigmataea. Scarce on old gravestones.

- Lepraria incana*. Common on the brick bases of chest-tombs and tree trunks.
Parnelia sulcata. Scarce on wood and on a silicious chest-tomb.
Peltigera spuria. Known from a few heath graves, one in SM. This lichen is now called *P. didactyla*.
Physcia adscendens. Common on nitrogen-enriched gravestones.
P. caesia. As above. Also on walltops.
P. orbicularis. As above.
P. grisea. As above.
Verrucaria nigrescens. Common on chest-tombs.
V. muralis. Common with the above.
Xanthoria parietina. Common on nitrogen-enriched stonework.
X. aureola. On headstones of the 1970s in the extreme west of KG.

FUNGI

BOLETALES

- Boletus subtomentosus*. On a grass verge by Centre Avenue.
Leccinum scatrum. Under a birch in SM in 1982.
L. duriusculum (*Boletus duriusculus*). Under white poplars on the western lawn.
Paxillus involutus. Under and near planted trees on the western lawn.

RUSSULALES

- Russula* sp. On a grass verge by Centre Avenue.
Lactarius subdulcis. Growing with the above.

AGARICALES

- Hygrocybe psitticina* (*Hygrophorus psittacinus*). On the western lawn in some years only.
Camarophyllus niveus. Seen on a heath grave and on an ant hill.
C. virgineus. On lawns. Parasitized by *Paecilomyces marquandi*.
Pleurotus ostreatus. Common on dead trunks (Figure 2).
Rickenella fibula. On moss on a ledger grave.
Clitocybe clavipes. In leaf litter under holm oak.
C. nebularis. In leaf litter under horse chestnuts.
C. dealbata. On lawns in KG and SM.
C. rivulosa. Same as the above.
C. flaccida. In leaf litter.
Lepista nuda. In leaf litter under horse chestnuts.
L. saeva. On holm oak leaf litter which was strewing a ledger grave by Centre Avenue.
Laccaria laccata. On the western lawn.
Tricholoma gambosum. On the lawn east of the Doric Temple.
Lyophyllum aggregatum. On short grass among graves in the west of KG.
Flammulina velutipes. Common on stumps.
Marasmius oreades. Common on lawns, rarely forming 'fairy rings'.
M. epiphyllus. On a shady bank by Centre Avenue.
M. ramealis. On decayed damp twigs.
Mycena flavo-alba. Common on lawns.
M. leptcephala. Common, growing with the above.
M. polygramma. On decayed wood.
Pluteus cervinus. On a hollow stump.
Cortinari subgenus *Leproclybe*. On a grass verge by Centre Avenue.
C. cinnamomeus. On the western lawn.
Hebeloma crustuliniforme. On the western lawn where it may form rudimentary fairy rings.
Incocybe geophylla, including var. *lilacina*. On a grass verge by Centre Avenue.
I. fastigiata. On the western lawn.
Tubaria furfuracea. On a mossy gravel path.
Galerina hyphnorum. On moss on a heath grave.
Stropharia aeruginosa. Waysides. Uncommon.
Hypholoma fasciculare. Common on stumps and decaying wood, including standing trees.
Lacrymaria velutinum. On a mossy gravel path in the extreme west of KG.
Pholiota squarrosa. On the base of an ash tree by Centre Avenue.
Gymnopilus junonius. On the base of a trunk of plane tree in SM in 1981.

Psathyrella gracilis. Waysides.

Coprinus atramentarius. By gravel paths. Grassy places.

C. micaceus. As above.

C. plicatilis. Grass verges.

C. disseminatus. On buried and decaying wood.

Agaricus campestris. On a grass verge by Centre Avenue.

A. silvaticus. In leaf litter under horse chestnuts.

Lepiota pseudohelveola. In leaf litter by Centre Avenue.

L. rhacodes. Common under trees. On grass and in leaf litter.

Amanita muscaria. Under a birch east of the main entrance.

GASTEROMYCETES

Lycoperdon pyriforme. On buried wood east of the main entrance.

APHYLLOPHORALES

Stereum rugosum. Common on dead wood.

S. lirsutum. On dead wood.

Chondrostereum purpureum. Common, especially on fallen trunks.

Trametes versicolor. Common on stumps.

Grifola gigantea. On dead trunks and buried wood.

Lenzites betulina. On a stump.

Irpex obliquus. Uncommon on dead wood.

Ganoderma applanatum. On stumps and standing trunks.

G. lucidum. Scarce on dead wood.

Lyomyces sambuci. Common on dead wood.

Coniophora puteana. The same as above.

HETEROBASIDIOMYCETES

Auricularia auricula-judae. On a fallen elder trunk and stump.

Tremella foliacea. Common on dead wood.

Dacrymyces stillatus. On decayed fallen branches.

ASCOMYCETES

Peziza sp. On a fallen poplar trunk.

Helotiaceae sp. Common on damp twigs.

Hypoxylon fragiforme. On a fallen beech trunk.

Nectria cinnabarina. Abundant on dead branches.

Ustilina deusta. On a stump in woodland.

Xylaria hypoxylon. The same as above.

X. polymorpha. As above. Growing with it.

MYXOMYCETES

Various species are encountered.

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The Survival of Rural Hedgerows in a London Borough

by L. R. WILLIAMS*

Summary

Over 30 km of surviving rural hedgerow and 1,242 standard hedgerow trees were found in the London Borough of Brent. Survey results for two of the parishes within the Borough were described in previous papers. The results for Wembley are given here to complete the study. The method used, the distribution of the hedgerows and possible applications of the method are discussed.

Introduction

The aims of this study were to locate surviving rural hedgerows or their remnants in an urban area and to identify factors affecting their survival. Two previous papers have summarised the quantity of surviving agricultural hedgerow in the two adjacent parishes of suburban Kingsbury (Williams, McLauchlin and Harrison 1987) and the more urban Willesden (Williams and Smith 1988). In this final paper of the series, the survey results for Wembley are presented, thus completing the hedgerow survey for the London Borough of Brent which is synonymous with these three parishes. The Borough has extensive suburbia, urban and inner-city environments, but also a rural enclave, Fryent Country Park, with an original hedgerow landscape.

For convenience, Wembley (area 18.5 square km) is referred to as a parish in this paper, though unlike Kingsbury and Willesden which were parishes in their own right, Wembley was part of the larger Harrow parish until the late 19th century.

The London Borough of Brent lies between about six and eighteen kilometres north-west of central London. It has an area of about 44.6 square kilometres and a population of about 268,000 (1978). Geologically, the area is largely of London Clay. An adjacent part of the London Borough of Barnet in the vicinity of the Welsh Harp Reservoir was also surveyed.

Methods

The same method was used as in the earlier parts of the survey and as described by Williams and McLauchlin (1988). Basically it involved locating surviving hedgerows and standard (timber) sized trees using fieldwork; and then map evidence dating from a period when the area was still rural, e.g. the six inch to the mile (9.5 cm to the km) Ordnance Survey maps of the mid-19th century or Inclosure Award maps. Maps of similar scale were superimposed over a light-box, to check that the hedges corresponded to field boundaries shown on the rural maps.

Local areas were surveyed on foot, though opportunistic use was made of other forms of transport and vantage points. Lengths of surviving hedgerow and of any associated earthworks were estimated by pacing, though no length would be assigned to isolated standard trees. The location and grid reference were recorded on sketch maps. Shrub and tree species present were identified; and the number of standard trees counted. For the purposes of this survey, standard trees had a girth of at least 150cm at 150cm above ground level. Scrubby species were not considered as standards. Scientific names follow Clapham, Tutin and Moore (1987). The survey was undertaken between 1983 and 1987.

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Results

In Wembley, 232 former agricultural hedgerows or their remnants were found. Surviving hedgerow totalled an estimated 14,051 metres in length, of which about 7,657m had some form of earthwork, usually a bank and ditch. Oak, mainly *Quercus robur*, was recorded in 138 of the 232 hedges, English elm *Ulmus procera* in 113 hedges, elder *Sambucus nigra* in 101, common hawthorn *Crataegus monogyna* in 98, ash *Fraxinus excelsior* in 87, hybrid hawthorns *Crataegus* × *media* in 57, sycamore *Acer pseudoplatanus* in 49, blackthorn *Prunus spinosa* in 41, wild roses *Rosa* spp. in 30, garden privet *Ligustrum ovalifolium* in 22, field maple *Acer campestre* in 16, woodland hawthorn *Crataegus laevigata* and horse chestnut *Aesculus hippocastanum* in 14 hedges each, holly *Ilex aquifolium* in 11, dogwood *Cornus sanguinea* in 10, hornbeam *Carpinus betulus* and unidentified willow *Salix* spp. in nine hedges each, common lime *Tilia* × *vulgaris* in eight, crack willow *Salix fragilis* in seven, apple *Malus* spp., silver birch *Betula pendula*, hazel *Corylus avellana* and snowberry *Symphoricarpos rivularis* in six hedges each, cherry *Prunus* spp. in four, wych elm *Ulmus glabra* and Swedish whitebeam *Sorbus intermedia* in three hedges each, beech *Fagus sylvatica*, yew *Taxus baccata* and poplars *Populus* spp. in two hedges each, while the following species were recorded in one hedge each: broom *Cytisus scoparius*, Scots pine *Pinus sylvestris*, wild cherry *Prunus avium*, pyracantha *Pyracantha coccinea*, grey willow *Salix cinerea*, whitebeam *Sorbus aria* and wild service tree *Sorbus torminalis*.

The total number of hedgerow standard trees found in Wembley was 541. Oak, mainly *Quercus robur* but possibly including other oak species, accounted for 328 of these, 93 were of ash *Fraxinus excelsior*, 80 of horse chestnut *Aesculus hippocastanum*, 13 of sycamore *Acer pseudoplatanus*, 11 of common lime *Tilia* × *vulgaris*. six of each of crack willow *Salix fragilis* and field maple *Acer campestre*, two of hornbeam *Carpinus betulus* and one each of Scots pine *Pinus sylvestris* and wild cherry *Prunus avium*.

Taking the results for the three parishes together, 520 hedgerows with a total length of 30,973 metres were identified in the Borough. Each hedge was assigned a reference number and a summary of data on each hedge has been deposited at the Grange Museum, Neasden NW10.

Table 1 summarises the survey results of the quantity of hedgerow in each of the three parishes. By using data for that part of Fryent Country Park within Kingsbury, it is possible to compare the present quantity of hedgerow with a rural area. Thus there were 54 hedges with a total length of 7,169m in an area of 0.65 square km, giving an average of 11km of hedgerow per square km. Compare this with the average 1.9km per square km for all of Kingsbury, 0.76km per square km for Wembley and an average of only 0.13km per square km for Willesden. At the Country Park there were 6,256m (9.6km per square km) of hedgerow earthworks and 191 standard trees (294 per square km).

TABLE 1. Surviving rural hedgerows in the London Borough of Brent, 1983-87

No distinction is made between hedges in various conditions of management. Parish boundary hedges with other Boroughs have been included. Boundaries between Kingsbury and Wembley have been assigned to Kingsbury.

	Parish		Borough	
	Kingsbury	Wembley	Willessden	Brent (total)
Area of parish (km ²)	7.44	18.44	18.75	44.64
Number of hedges	191	232	97	520
Length of hedgerow (m)	14,490	14,051	2,432	30,973
Hedgerow density (km per km ²)	1.95	0.76	0.13	0.69
Standard trees (no.)	525	541	176	1,242
Standard trees per km ²	70.6	29.3	9.4	27.8
Hedgerow earthworks (m)	11,244	7,657	689	19,590

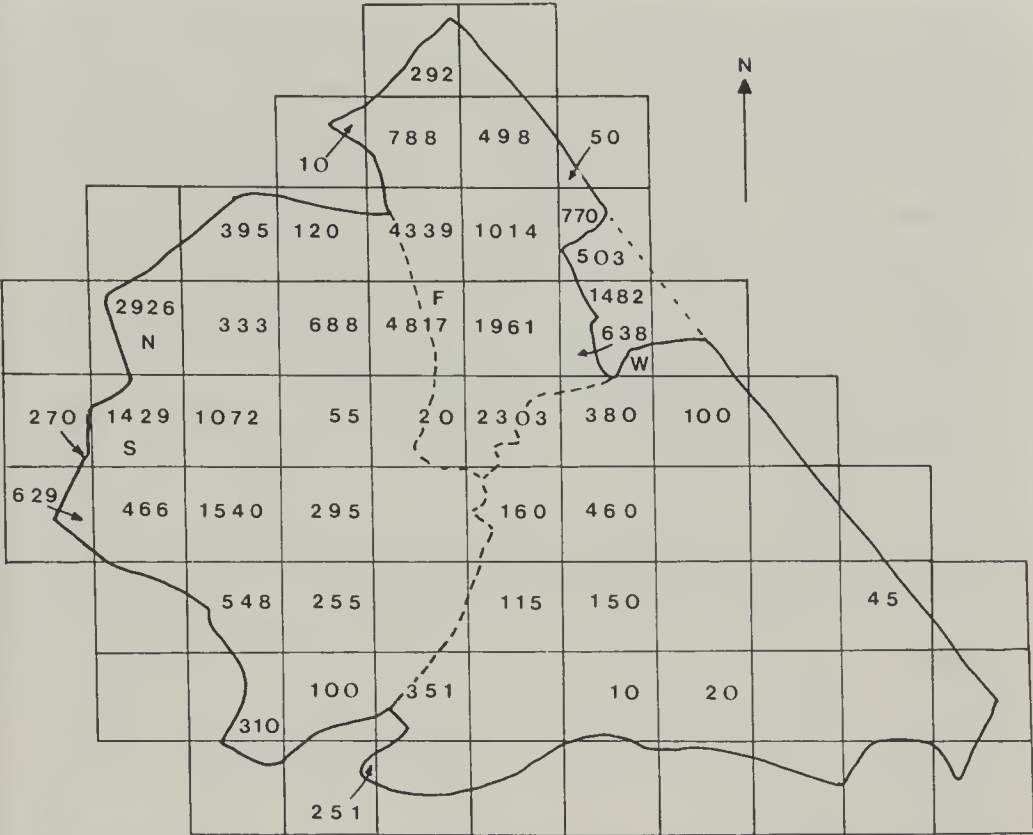


FIG. 1. Approximate lengths (metres) of surviving agricultural hedgerows in the London Borough of Brent. Each square represents one square kilometre of the national grid. Where a hedge was in more than one square, the length has been assigned to the more appropriate square. Blank squares indicate areas with no surviving hedgerow length (though some isolated standard trees may have been recorded). The internal broken lines mark the three parishes of Kingsbury in the north-east, Wembley in the west and Willesden to the south-east. An area of the London Borough of Barnet is included to the east, near to the Welsh Harp Reservoir (W). N- Northwick Park, F - Fryent Country Park, S - Sudbury.

The approximate lengths of surviving hedgerow in each one-kilometre square were plotted in Figure 1 and confirmed the uneven distribution in Table 1. Forty-seven per cent of the total hedgerow length in Brent was found in the largely suburban, but small, parish of Kingsbury, forty-five per cent in Wembley and only eight per cent in the more urban Willesden. The distribution of the hedgerow standards followed a similar pattern with forty-two per cent of the trees in Kingsbury, forty-four per cent in Wembley and fourteen per cent in Willesden. Note that Fryent Country Park lies in both Kingsbury and Wembley, accounting for approximately ten kilometres of the surviving hedgerow in these two parishes.

Hedgerow earthworks, usually bank and ditch systems, but including double banked hedges, lynchets and streamsidcs, were associated with 19.590m of the total hedgerow.

A total of 1,242 hedgerow standard trees were found in the Borough. Oak, mainly *Quercus robur*, accounted for 910 (73%) of these and was the most frequent standard in all three parishes. Ash *Fraxinus excelsior* was the second most frequent standard in each parish but only accounted for 153 (21%) of all standards. There were 87 horse chestnut *Aesculus hippocastanum*, 25 crack willow *Salix fragilis*, 16 field maple *Acer campestre*, 15 common lime *Tilia* ×

vulgaris, 13 sycamore *Acer pseudoplatanus*, seven Italian poplar *Populus × canadensis*, six hornbeam *Carpinus betulus*, three unidentified willow *Salix* spp., three cherry including *Prunus avium* and one each of beech *Fagus sylvatica*, Scots pine *Pinus sylvestris*, common pear *Pyrus communis* and wild service tree *Sorbus torminalis*. Eighty of the 87 horse chestnut were recorded in Wembley which also had relatively high numbers of ash, common lime and sycamore. This suggested a high proportion of hedges incorporated into park or garden landscaping as at Barnhills Park, Wembley Park and Barham Park.

The occurrence of species in the hedgerows varied between the parishes as can be seen for the species listed in Table 2. For example, wild roses *Rosa* spp. were more common in the rural hedgerows, while sycamore *Acer pseudoplatanus* and horse chestnut *Aesculus hippocastanum* were absent from the rural hedges but were frequent in the suburban and urban hedges.

A further 1,985m of hedgerow and 86 standard trees representing 28 hedges were found in the 1.05 square km survey in the parish of Hendon, London Borough of Barnet.

TABLE 2. Percentage of hedges containing the more common tree/shrub species in Kingsbury, Wembley and Willesden. The species are listed in an approximate order from those that appear to be characteristic of rural hedges to those that appear to be associated with the hedge remnants in town. For Kingsbury the data are presented for both the suburban and the rural Fryent Country Park area of the parish. Note that Wembley also contains a few rural hedges at Fryent Country Park, but these are included in the Wembley total here.

Species	Kingsbury		Wembley	Willesden
	rural	suburban		
<i>Rosa</i> spp. wild roses	50	3	13	2
<i>Prunus spinosa</i> blackthorn	79	21	18	3
<i>Malus</i> spp. apple	17	2	3	0
<i>Cornus sanguinea</i> dogwood	13	2	4	1
<i>Crataegus laevigata</i> woodland hawthorn	8	4	6	1
<i>Crataegus × media</i> hybrid hawthorns	48	26	25	12
<i>Acer campestre</i> field maple	17	12	7	7
<i>Sambucus nigra</i> elder	62	49	44	28
<i>Fraxinus excelsior</i> ash	33	28	38	17
<i>Quercus robur</i> oak	73	84	59	68
<i>Crataegus monogyna</i> common hawthorn	29	36	42	19
<i>Ulmus procera</i> English elm	42	34	49	34
<i>Ligustrum ovalifolium</i> garden privet	2	13	9	5
<i>Aesculus hippocastanum</i> horse chestnut	0	0	6	5
<i>Acer pseudoplatanus</i> sycamore	0	19	21	22

Discussion

The Brent hedgerow survey appears to have been the first comprehensive survey of surviving agricultural hedges in an urban area, although there have been many studies of rural hedgerows. The method used and the results obtained suggest several applications for further study, several of which are discussed below.

A. The method

The results show that the method can reliably locate former hedges and distinguish these from more recently planted trees in urban areas. The two previous papers, on Kingsbury and Willesden, have identified some of the problems. The greater the time since urban development commenced and the more urban an area, the less is the chance of hedgerow evidence surviving. After long periods of time the original hedges are lost through natural death of the trees, often accentuated by neglect or even urban redevelopment schemes which take little account of the original field layout. Tall buildings and a high density

of building are often inimical to hedgerow survival; and also considerably reduce access for survey purposes. Confusion with planted trees that have grown to standard size in gardens and parks is possible, but the planted trees are often of different species to those of the original hedgerows. This illustrates why it is essential to check the results by superimposing the modern urban maps over Ordnance Survey, Inclosure Award or tithe maps (Kaine and Prince 1985) dating from a time when the area was still rural.

Willesden was the first of the three parishes to experience the change from a series of rural hamlets to that of an urban Borough. The population rose from about 4,000 in 1861 to 18,000 in 1875, 80,000 in 1895 and to about 140,000 in 1905. Willesden has therefore been urban for about ninety years, as compared with about sixty years for Wembley and Kingsbury where rapid development commenced with the suburban expansion of London in the 1920s and 1930s. Infill development has continued in all three parishes up to the present time. Wembley is more urban than Kingsbury, but the difference is difficult to quantify. It would appear reasonable to suggest that loss of hedgerow is related to the density of urban development and to the length of time since the development commenced. Hedgerows and standard trees were more likely to have survived amongst suburbia than in the inner-city.

B. The role of ownership boundaries

The method used in this survey relies on the assumption that hedgerows marked field and ownership boundaries in rural areas. In the north and west of Britain this function was performed by drystone walls. Taylor (1975: 160) has succinctly described how the shape of fields largely determined the layout of 19th and 20th century urban development; and illustrates an example of a modern housing estate at Swaffham Bulbeck, Cambridgeshire within a field formed by Parliamentary enclosure of 1801. The boundaries of such development are largely governed by that of the pre-existing land ownership which the developer had acquired. Field shape has affected town layout in Leicester, Liverpool and the suburbs of Hunslet and Armley in Leeds (see also Ward 1962). In Nottingham, Hoskins (1955) has described how early 19th century urban development was confined to a central area until after Parliamentary enclosure in 1845 enabled the release of new small fields for urban expansion. Taylor (1975) mentions Peterborough where the pattern of development was influenced by that of the roughly rectangular 17th and early 18th century enclosures. In Cambridge, urban development from 1820 onwards was also related to the geometrical field pattern laid out by agricultural enclosures. Contrast this with the situation in Willesden (Morris 1950) where many of the post-war planning problems were a direct result of the original developers using the tortuous field and road layout that existed in rural Willesden.

Kaine and Prince (1985: 246-7) draw attention to several studies of towns with a close correlation between the pre-urban field pattern and subsequent urban development. As expected, field boundaries which were also ownership boundaries had more influence than the internal field boundaries which were often removed during urban development. This was not always the case. During the Brent survey, Williams and McLauchlin (1988) found that at least one inter-war developer retained hedgerow trees within the suburban Barn Hill estate, probably to make the estate more attractive to potential homebuyers and many of these trees still stand. Note however that only the standard trees were retained, thus the shrub component of the hedgerows was removed. This is relevant to the comments below on the loss of species from hedgerows in urban areas.

The method used in this study should therefore find applications in other towns, especially if attention is paid to the relationship between the original field boundaries and surviving hedgerow evidence. Results may be compared with the local development history, the agricultural field pattern and to the tree

species which may have been present in the field boundaries. Noble (1982) has suggested and used land tax returns to study the change in field ownership from rural to urban uses for six market towns in Yorkshire.

As a general rule, field patterns vary on a regional basis, but there may be local anomalies and even sharp contrasts where regional field systems meet. An example can be seen at Fryent Country Park (Williams and Cunnington 1985; Cunnington (in press), where the original field and hedgerow pattern still survives. To the west of the parish boundary, the hedgerow pattern of Harrow (Wembley) was of roughly regular fields representing piecemeal enclosure some centuries before the Inclosure Award of 1817. Kingsbury to the east had an irregular pattern of fields which were the result of woodland assarts (clearance). Almost all the Middlesex parishes to the west had enclosure acts, but only a few to the east (Tate 1948). Thus these two parishes represent a division between the planned and the ancient countryside; or between the Midland and the Kentish field systems of Gray (1959).

Part of this parish boundary was a lane from London (Braun 1937*a* and *b*). Also at the Country Park is an example of a perimeter hedgerow of a former country estate along which a landscaped woodland was planted (Williams, Cunnington and Hewlett 1985). Part of the field boundary between the parishes of Kingsbury and Hendon (now the London Boroughs of Brent and Barnet) can be observed as a few wooden posts when the Welsh Harp Reservoir is drained for repairs.

C. Survival of flora and fauna

While surviving hedgerows in urban areas may benefit urban wildlife and make an important contribution to the local landscape, the results of this survey suggest that such remnants make little contribution to the conservation of rare species. Compared with the good condition of hedgerows at Fryent Country Park, the suburban and urban hedgerows had poor floras. For example, the rare narrow-leaved bitter-cress *Cardamine impatiens* and wild service tree *Sorbus torminalis*, which occur in hedgerows at Fryent Country Park, were not found in hedgerows elsewhere in Brent. Evidence for this is given by Table 2, which shows the percentage of hedges in which the more common shrub and tree species were found. In particular, wild roses *Rosa* spp. and woodland origin indicators such as dogwood *Cornus sanguinea* and field maple *Acer campestre* were seldom found in the urban hedges. English elm *Ulmus procera* was most common in the Wembley hedges, perhaps because a higher proportion of these hedges were of planted origin. Some species were not found in the rural hedges, but were either planted into or colonised the hedges in the urban areas, e.g. horse chestnut *Aesculus hippocastanum* and garden privet *Ligustrum ovalifolium*. Sycamore *Acer pseudoplatanus* occurred frequently in the suburban and urban hedges but was absent from the hedgerows at Fryent Country Park. Horse chestnut, sycamore, ash *Fraxinus excelsior* and common lime *Tilia* × *vulgaris* were often used for park and garden landscaping along existing rural hedges.

These results and the large difference in the average length of hedges between the rural Fryent Country Park and the urban/suburban areas suggest two main factors responsible for the change in the floral composition of hedgerows when they become part of the urban environment. Firstly, management, or lack of it, is completely different from that in rural areas. Attention has been drawn to the removal of the shrub component of hedges during urban development and frequently the whole hedge is removed. Kent (1975) stated that Middlesex had probably lost more of its natural area than any other vice-county and listed three hedgerow shrub plants that had become extinct in Middlesex. The Kingsbury hedgerow paper has chronicled the decline in the hedgerow/woodland over several centuries. Once a hedge is within the urban area, it is unlikely to be managed as a hedge. Neglect, waste tipping and further shrub removal to provide room for other land uses are all agents in the extinction of the original

species. Secondly, the hedge is no longer near to other hedgerows or woodland. Colonisation will instead tend to be by species encouraged or planted by human activity.

Dating of urban hedges by the method suggested by Pollard, Hooper and Moore (1974) for rural hedges would be made impractical by such gains and losses in the shrub flora, and by the lack of representative 30 metre hedgerow sections. Williams and Cunnington (1985) have shown that the Hooper method could not be used with reliance even on the complete hedgerows at Fryent Country Park, because there hedges had arisen as woodland assarts (Pollard *et al.* 1974). Johnson (1980), Cameron (1984) and Hussey (1987) have put the limitations into perspective. Various authorities have suggested the use of indicator species to help determine the origin of hedges, but the results of this study suggest that this too is impractical in urban areas due to the loss of hedgerow species and rapid colonisation by non-hedgerow species.

Few studies of hedgerows have attempted to distinguish the three hawthorn species. *Crataegus monogyna*, *C. × media* and *C. laevigata*. An analysis of the hawthorns at Fryent Country Park revealed that the younger hedgerows had higher proportions of *C. monogyna* and that the older hedgerows had more *C. laevigata*. When the distribution of hedgerow hawthorns was plotted for the whole Borough, it was apparent that *C. × media* was much more widely distributed than previous information suggested (Williams 1989). Similarly the survey data could be used to produce distribution maps for other hedgerow species.

Surviving hedgerows did make an important contribution to the birdlife of suburban Dollis Hill, Willesden (Simms 1962) and to that at Fryent Country Park (Batten 1972). At Dollis Hill several bird species used the hedgerow English elms *Ulmus procera* before the Dutch elm disease epidemic of the 1970s when there must have been several hundred standard elm trees of hedgerow origin in the Borough. Both the hedgerow snail fauna (Cameron, Down and Pannett 1980) and the lichen flora were limited and typical of the local area.

D. Urban habitat assessment

A surprising quantity of surviving hedgerow was found in the Borough (Figure 1 and Table 1) though this ranged from practically zero in the more inner-city parts of Willesden to that of the well-hedged landscape at Fryent Country Park. On the Kingsbury parish side (area 0.65 square km) of the Park, there were 54 hedgerows with 191 standard trees and 7,169m of hedgerow. At 11.0km per square km, this hedgerow density was higher than the average for improved farmland in England and Wales which has been estimated at about 6.3km per square km (Pollard *et al.* 1974: 59-68; O'Connor and Shrubbs 1986: 138-43). The Fryent Country Park figure is however probably typical of pre-20th century rural Middlesex; and the 1864 Ordnance Survey maps show an estimated 80km of hedgerow in the parish, or 10.7km per square km.

It is of interest to compare the hedgerow distribution with a survey of wildlife sites in the Borough undertaken by the Greater London Ecology Unit (1987), using wildlife and public access criteria. They used a ranking system of sites of metropolitan importance to London, sites of borough importance, sites of local importance and green corridors (rivers, canals and vegetated railway land). Once these were identified, areas of deficiency were determined. Surprisingly, much of the more inner city parts of Willesden, including areas almost devoid of surviving hedgerows, were not classified as deficient in wildlife sites, as they were within one km of the Grand Union Canal, a site of metropolitan importance, even though the section through Brent had limited wildlife. Yet some areas of Sudbury (Figure 1) in the suburban part of Wembley, with high densities of surviving hedgerow, were classified as deficient as they were more than one km from an accessible metropolitan or borough wildlife site. These anomalies apart, there was reasonable agreement between the two surveys. Two

areas with high hedgerow densities, Fryent Country Park and the Welsh Harp Reservoir, were the only other sites in the Borough to be accorded metropolitan site status. The two surveys were, however, designed to record different aspects of wildlife habitat. Hedgerow lengths and numbers of standard trees are easier to quantify than subjective assessments of wildlife value and public access. It is suggested that data on the distribution of hedgerows, as in Figure 1, could be used to help assess the wildlife or landscape value of towns. The distribution of standard trees produced a similar pattern to that in Figure 1.

West Midlands County Council (1984) claim to have surveyed all the hedges exceeding 200m in length in their area, though this would obviously exclude many remnants. They found that hedges in the urban areas were poorly maintained in comparison to those in the rural areas of Solihull. Teagle (1978) commented on the value of hedges to wildlife in the West Midlands conurbation, but pointed out that as the various townships have fused to form one conurbation, it would not be so easy to apply the convenient labels of urban, suburban and rural to describe the concentric stages of development as around London.

E. Conservation of hedges in towns

Surviving hedgerows and trees may contribute greatly to local landscaping in towns. Although they are best conserved in a rural environment, it is more desirable to incorporate them into a planned development than to remove them completely. The Ministry of Housing and Local Government (1958) illustrate a good example from Bracknell of how this can be achieved. In many cases trees can be retained close to new buildings by following the technical guidelines produced by the British Standards Institution (1980), Hebblethwaite (1969), Helliwell (1985) and the National House-Building Council (1985). While the purpose of this survey was to trace surviving agricultural hedgerows many years after urbanisation, the opposite approach can be adopted as at rural Hamilton in Leicester, where the more valuable hedgerows were identified by the City Wildlife Project (1985). As a result the Hamilton Local Plan was amended, so that some of these hedgerows should be preserved and incorporated into a proposed new housing estate. In Brent only a small proportion of the hedgerows are within Conservation Areas (Brent Development 1984) and a few standard trees are subject to Tree Preservation Orders. The results of this survey suggest that hedgerow protection in towns achieves more for the local landscape than for species conservation. Similarly, while Fordham and Iles (1987) suggest that hedgerows can be incorporated into golf courses, this should be accompanied by appropriate management. Often the hedges are neglected and the grass-cutting machinery removes the herbaceous edge to produce a scrubrow.

The Brent results could be extrapolated to suggest that there are about 1,000km of surviving agricultural hedgerow in the capital and many thousands of trees which contribute to the local wildlife and landscape.

Acknowledgements

I wish to thank Kathy Northcroft, Dr D. Hooke, members of Barn Hill Conservation Group, the Brent Group of London Wildlife Trust, Wembley History Society and other people who have assisted with the survey.

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Book Reviews

The Dragonflies of Essex. By E. Benton. The Essex Field Club. London. 1988. 138pp. £5.95 pbk. ISBN 0 905637 14 3. Obtainable direct from Mark Hanson, 28 Sylvan Road, London E7 8BN, £6.50 inclusive.

Seventy people surveyed the Odonata of Essex between 1977, when the first edition of Hammond's 'Dragonflies' (1977, rev. 1983) appeared and 1987 when Benton's book went to press. Initial results in the early 1980s showed more about the movements of the observers than the distribution of dragonflies, but from 1983 onwards the county was covered systematically. L.N.H.S. members may recall Dr Benton's talk on the subject at Burlington House in April 1984. His first aim in writing the book is to help people who are interested in dragonflies but don't yet know much about them, and his second is to communicate the results of the survey. The two aims are complementary. This book actually tells you where to go to find dragonflies (complete with map references) and which species have recently been found there (Chapters 3 and 4). To my mind, it is well worth the money just for that. It only weighs 8oz, so you can put it in your rucksack together with the map, go to Epping Forest and then look at the table on page 37 to find out which are the best ponds.

The survey, described in Chapter 1, is an excellently co-ordinated and very meticulous piece of work which is particularly valuable as a basis for conservation, especially of the rarer species. Benton has made a thorough search of the literature and presents a fascinating account of the history of dragonfly recording in Essex (Appendix B) and a most interesting list of references. Nine species have not been recorded in Essex since 1903 (Appendix A). Benton comments that though in some cases these are local extinctions, in others, the original record is open to doubt.

For each of the Essex species, Chapter 4 describes how to recognise it, how common it is in the county and where it was found during the survey. The comments are helpful: for example, of *Erythromma najas* 'the hindmost segments of the male abdomen are bright blue. This ... could lead to some confusion with our commonest damselfly *Ischnura elegans*, but in the latter only segment 8 is coloured blue dorsally whilst segments 8 and 9 are so coloured in *E. najas*. In addition, the red eyes of mature specimens are very noticeable.'

Presumably Benton included Chapter 2, the Natural History of Dragonflies, and Appendix C, a key to adults of the Essex species, on the assumption that, initially at least, his would be the only book a beginner had. I suspect that many people would find the key very frustrating and I would recommend them to get a field guide, such as the paperback edition of Hammond, as well.

Reference

HAMMOND, C. O. 1977. Revised MERRITT, R. 1983. *The Dragonflies of Great Britain and Ireland*. Ed. 2. Harley Books. Colchester. £19.95 hbk £9.95 pbk.

RUTH DAY

Adults of the British Aquatic Hemiptera Heteroptera: a Key with Ecological Notes. By A. A. Savage. Freshwater Biological Association. Scientific Publication No. 50. 1989. 173pp., 81 text figures. £10.00. ISSN 0367-1887. ISBN 0 900386 48 7.

This latest F.B.A. publication on the water-bugs was received as we went to press. It is interesting to note that the first title in this series appeared fifty years ago and was a key to one of the water-bug families, the Corixidae. After the Introduction, which includes a classification and checklist of the 63 species and details of collection and preservation, there follow keys to families and species and a long section on ecology and biology. The keys are clearly worded and the text figures are well executed.

This is a very welcome addition to the series.

K. H. HYATT

The Aquatic Flora and Fauna of the New River – a 375-year-old Man-made Water-course

by S. J. SMITH*

Summary

The aquatic flora and fauna of the New River and its reservoirs south of Cheshunt, together with the Enfield Loop, were surveyed in 1986-87. Nineteen aquatic macrophyte taxa were recorded in the River. These included the rare *Oenanthe fluviatilis* which was widespread. In terms of the aquatic macrophytes, the New River could be divided into three distinct zones dominated by *Berula erecta*, *Sparganium emersum* and algae. This was surprising because the channel was fairly uniform. The vegetation of the reservoirs consisted mainly of marginal algal mats, but Hornsey Reservoir also had large quantities of *Ceratophyllum demersum* and *Elodea nuttallii*. The Enfield Loop was dominated by *Lemna gibba* and algae. Marginal plants were uncommon throughout the system.

A total of seventy-eight aquatic macroinvertebrate taxa were recorded in the River. The dominant groups showed a spatial zonal pattern similar to the aquatic vegetation. Gastropods and caddis-fly larvae were the most diverse groups with 14 and 15 taxa respectively. Several of the mayfly larvae recorded are uncommon in London. The macroinvertebrate fauna of Hornsey Reservoir was distinctly different from the other two reservoirs. The vegetation of all three was, however, dominated by dipteran larvae. The substrate of Hornsey was dominated by crustaceans, whereas, in the other two oligochaetes were dominant. The macroinvertebrate fauna of the Enfield Loop was characterised by high numbers of gastropods.

This study showed that the New River had a fairly diverse aquatic flora and fauna. Several of the species recorded are rare or uncommon in London. The reasons for this are no doubt related to the high quality of the New River water.

Introduction

History

The New River is an old aqueduct that runs from Ware in Hertfordshire to Stoke Newington in north-east London (Figure 1). It was built in the early seventeenth century (1609-13) to carry spring water from Ware to central London. The original length was about 39 miles, but modifications have reduced this to about 24 miles (Thames Water Authority 1984).

These modifications included the by-passing of winding sections at Enfield (the 'Enfield Loop') and Theobald's Park, and the closing of the New River south of Stoke Newington. Five reservoirs were also constructed along its length, two each at Cheshunt and Stoke Newington and one at Hornsey.

In the early 1980s, as part of a modernisation plan for water supply in the London area, the Thames Water Authority (T.W.A.) decided to build a new water-treatment works at Cheshunt. As a consequence the thirteen-mile section of the New River south of Cheshunt would no longer be required for water supply. Since this would have had serious consequences for the flora and fauna, the Applied Ecology Research Group, Polytechnic of Central London (P.C.L.) were commissioned by T.W.A. to carry out a study of the flora and fauna of the New River south of Cheshunt South Reservoir. In addition the three reservoirs, Stoke Newington East and West and Hornsey, and the Enfield Loop, were also surveyed (Figure 1).

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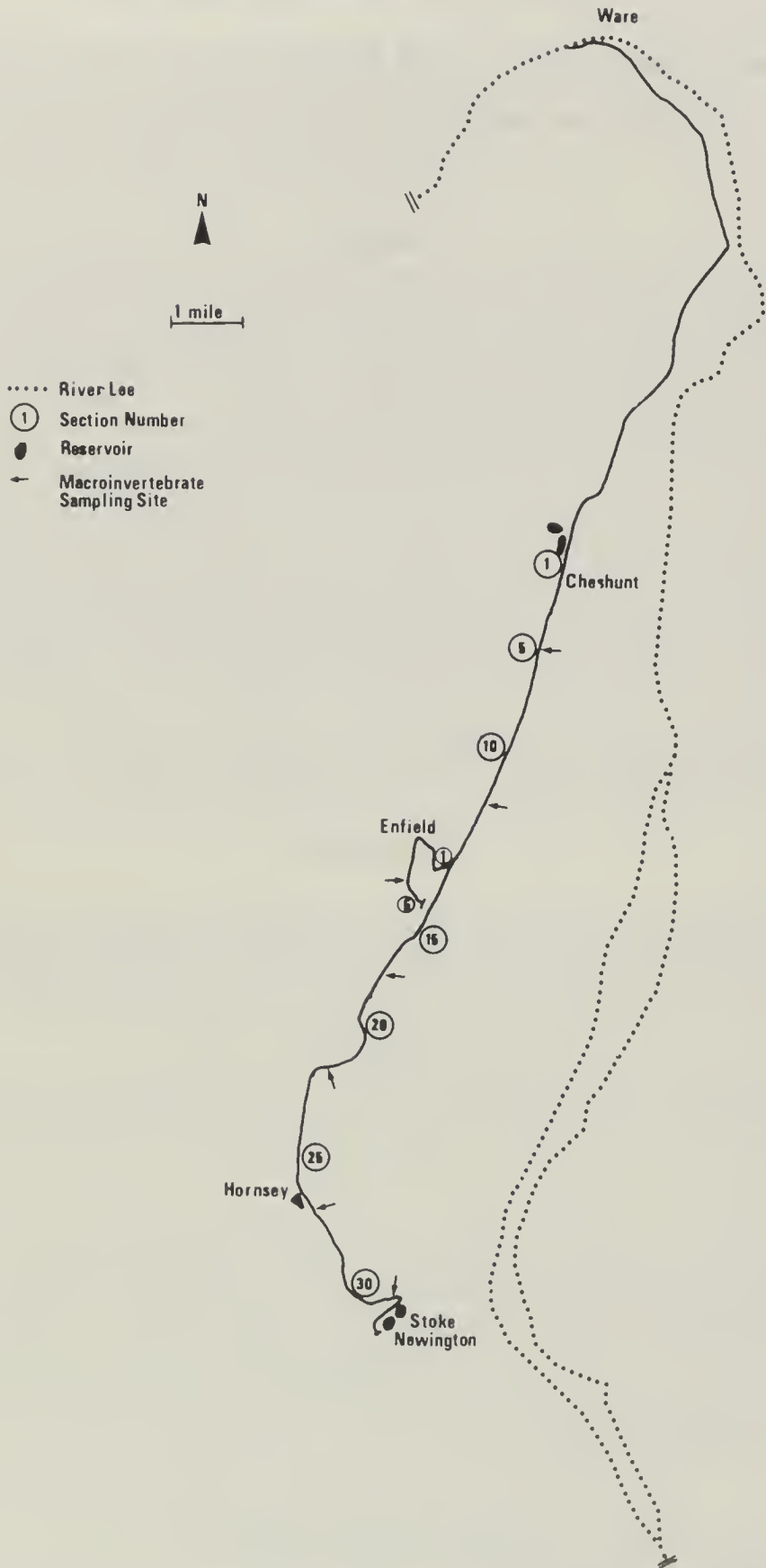


FIG. 1. Map showing the present course of the New River together with the reservoirs and Enfield Loop.

Hydrology

The New River south of Cheshunt generally consists of a straight channel with a near U-shaped cross-section. It is clay lined and supported by either wooden revetments or metal piling. Most of the channel is 7-9m wide and 1-2.5m deep. Silt sediments up to 1m depth occur but this varies due to dredging.

Since the mid-eighteenth century flow from the springs at Ware has been supplemented with River Lee water entering at New Gauge, Ware. During this study New River water was roughly 50:50 spring/River Lee. The water quality fell into the National Water Council Class 1 category, that is high quality (National Water Council 1981).

The discharge was about 165Ml/day falling to about 125Ml/day below Hornsey Reservoir due to the outflow there. The average velocity was estimated as 18cm/s north of Hornsey and 17cm/s below (Colin Thorne pers. comm.). The Enfield Loop is independent and receives only 0.5Ml of New River water daily as top-up.

Of the three reservoirs, Hornsey had the smallest surface area and was the shallowest. The residence times for the reservoirs were very short (1 to 3 days). The aqueduct and reservoirs were managed by T.W.A. The channel and waterside vegetation was regularly cut between April and October and the banks mown once or twice between June and October.

Methods

Aquatic Flora

The vegetation was surveyed during the summer of 1986. The New River, between Cheshunt and Stoke Newington, and Enfield Loop, were divided into sections approximately 0.5km in length (Figure 1). Each section was sub-divided into 50m lengths within which the percentage cover of macrophyte species was estimated from both sides of the channel. A grapnel was used to sample submerged vegetation. The percentage cover data within each section were averaged to estimate abundance.

Reservoir macrophytes were sampled using a grapnel lowered from a boat. Species abundance was assessed subjectively on the relative amount of vegetation recovered. Waterside species were surveyed separately based on presence or absence in a particular section or site. Plant nomenclature follows Clapham, Tutin and Moore (1987).

Macroinvertebrates

Six macroinvertebrate sampling sites along the New River and one in the Enfield Loop were chosen (Figure 1). Macroinvertebrates were collected from the aquatic vegetation during July/August (summer) 1986 and January/February (winter) 1987 by three two-minute sweep samples with a Freshwater Biological Association hand-net (mesh diameter of 0.96mm). The substrata were sampled by taking three 125cm³ lots of sediment in summer 1986 and three 0.023m² Ekman Grab samples in winter 1987. Six macroinvertebrate samples were taken from the vegetation and sediment of each reservoir, as in the New River, during summer 1986 and winter 1987 respectively.

After collection samples were live-sorted in the laboratory. Difficult taxa were stored in 70% alcohol for subsequent identification by relevant experts. Nomenclature follows Maitland (1977) except that molluscs follow Kerney (1976).

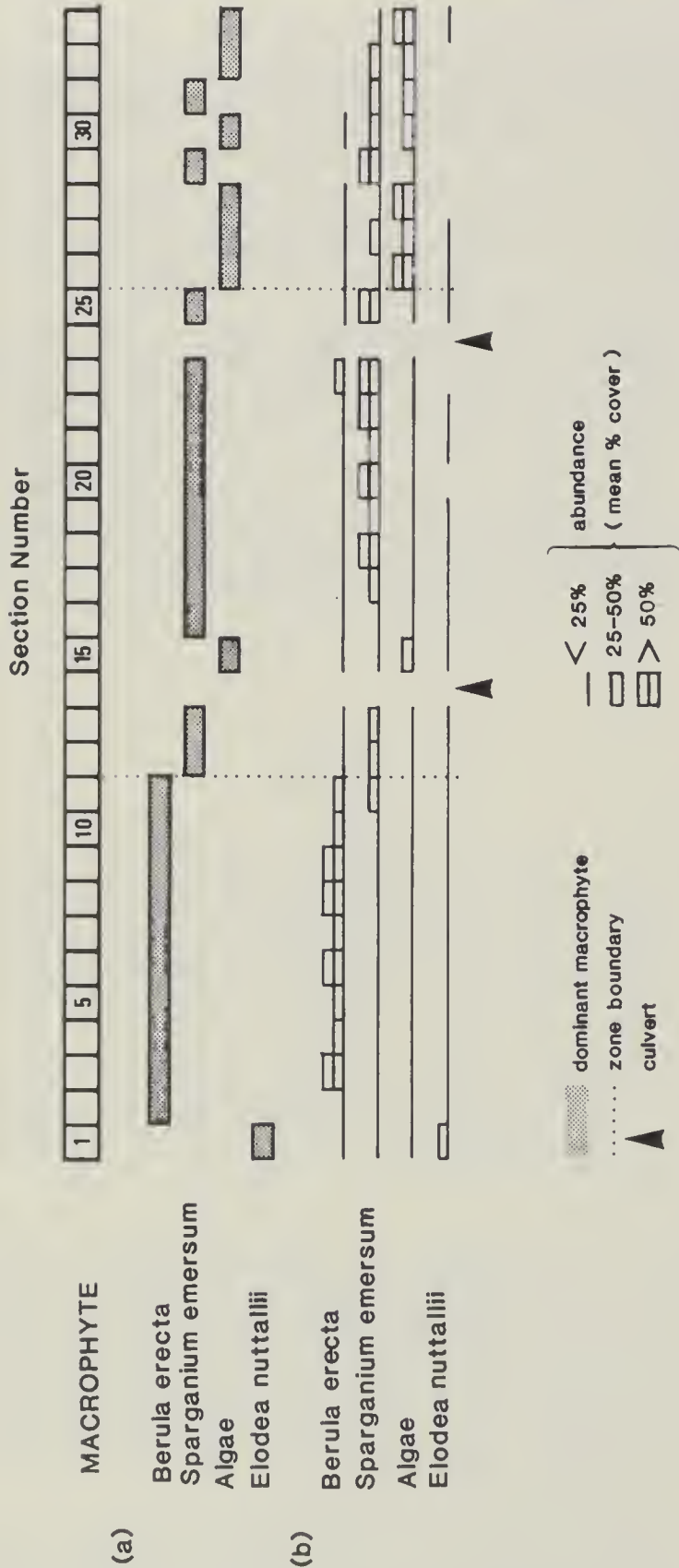


FIG. 2. (a) Dominant aquatic macrophytes by section for the New River; (b) Abundance by section of the dominant aquatic macrophytes in the New River.

Results

Aquatic Macrophytes

NEW RIVER

A total of nineteen aquatic macrophyte taxa were recorded. The New River could be divided into three zones based on the dominant macrophyte species: a northern lesser water parsnip *Berula erecta* zone, a central unbranched bur-reed *Sparganium emersum* zone and a southern filamentous green algae (mainly *Cladophora* spp.) zone (Figure 2a).

Berula erecta was only abundant in the northern zone, but *Sparganium emersum* was abundant in the central and southern zones (Figure 2b). Algae were, like *B. erecta*, generally only abundant within its zone of dominance.

The two Canadian pondweeds, *Elodea nuttallii* and *E. canadensis*, were both found in the river, with *E. nuttallii* the most widespread (Table 1). It was particularly abundant in the northern zone while *E. canadensis* was never abundant.

TABLE 1. Distribution of New River aquatic macrophytes by zone.

Macrophyte	Zone		
	Northern	Central	Southern
<i>Sparganium emersum</i>	100*	100	100
Algae	100	100	100
<i>Berula erecta</i>	100	100	50
<i>Callitriche hamulata</i>	100	100	50
<i>Oenanthe fluviatilis</i>	100	100	38
<i>Elodea nuttallii</i>	100	83	38
<i>Apium nodiflorum</i>	100	67	25
<i>Ranunculus penicillatus</i>	82	92	38
<i>Lemna minor</i>	64	83	50
<i>Elodea canadensis</i>	36	50	0
<i>Callitriche obtusangula</i>	18	25	0
Charophytes	0	33	0
<i>Callitriche stagnalis</i>	9	17	13
<i>Callitriche platycarpa</i>	18	25	25
<i>Potamogeton pectinatus</i>	0	58	63
<i>Potamogeton crispus</i>	0	0	13
<i>Potamogeton pusillus</i>	0	0	13
<i>Ceratophyllum demersum</i>	0	0	13

*Percentage of zone sections where macrophyte present.

Fool's water-cress *Apium nodiflorum* was associated with *Berula erecta* in shallower water. Although this species was only found at low abundance, it was common in the northern zone, but only occasional in the central zone and rare in the southern zone.

Fennel-leaved pondweed *Potamogeton pectinatus* was restricted to the central and southern zones and was locally abundant. Stream water crowfoot *Ranunculus penicillatus* var. *calcareus* was often found with *P. pectinatus*, but it was, however, frequent in the northern zone.

Four species of water starwort *Callitriche* were recorded, but only *C. hamulata* was widespread, being particularly abundant in the northern zone. The others (*C. platycarpa*, *C. stagnalis* and *C. obtusangula*) were found occasionally and *C. obtusangula* was absent from the southern zone.

River water dropwort *Oenanthe fluviatilis* occurred throughout the northern and central zones, but was absent from most of the southern zone; it was never abundant. The duckweed *Lemna minor* had a similar distribution.

Stoneworts (charophytes) were found in very small quantities in the central zone but were probably under-recorded. Two species, *Nitella mucronata* and *N. translucens*, were recorded from the limited amount identified.

Small amounts of curled pondweed *Potamogeton crispus*, lesser pondweed *P. pusillus* and rigid hornwort *Ceratophyllum demersum* were recorded in the southern zone.

RESERVOIRS

There was very little vegetation in the Stoke Newington Reservoirs. The dominant vegetation was a marginal algal mat, composing mainly *Cladophora*. Small quantities of *Potamogeton pectinatus*, small pondweed *P. berchtoldii*, *P. pusillus* and the charophyte *Nitella mucronata* were also recorded.

The vegetation of Hornsey Reservoir differed considerably from that of Stoke Newington. In addition to the marginal algal mat there were fairly extensive beds of both *Elodea nuttallii* and *Ceratophyllum demersum*. Small quantities of *Potamogeton pectinatus*, *P. pusillus* and the charophyte *N. mucronata* were also recorded.

ENFIELD LOOP

Most of the Enfield Loop was covered with a dense, floating carpet of fat duckweed *Lemna gibba*. Underneath the *L. gibba* there were generally large quantities of *Cladophora*. There were also occasional patches of *Elodea nuttallii*, ivy-leaved duckweed *L. trisulca*, and *Ceratophyllum demersum*. Small quantities of *E. canadensis* were also recorded.

In Enfield Park (section 4), where the channel had been diverted to form a small park lake, water lilies *Nuphar* sp. (*lutea*?), *Nymphaea* sp. (*alba*?) and *Nymphoides peltata* had been planted and *Lemna trisulca* was also common there.

Waterside Vegetation

NEW RIVER

Waterside plants were sparse, presumably because of the channel shape and regular cutting of the margins by T.W.A. Marginal plant cover was greater in the northern zone compared to the other zones.

Reed canary grass *Phalaris arundinacea* was the most common waterside species. It was found, growing in small stands, in half of the central and northern zone sections. Another relatively common marginal species was amphibious bistort *Polygonum amphibium*, which occurred in small quantities in several central and northern zone sections.

A large stand of lesser pond sedge *Carex acutiformis* (c. 150m²) was found in the northern zone where a small, adjacent earthworks had filled with water to form a shallow lagoon. Associated with this *C. acutiformis* stand were water forget-me-not *Myosotis scorpioides*, water-mint *Mentha aquatica*, branched bur-reed *Sparganium erectum*, green watercress *Nasturtium officinale* agg., marsh yellow cress *Rorippa palustris*, creeping yellow cress *R. sylvestris*, great water dock *Rumex hydrolapathum*, *Phalaris arundinacea*, celery-leaved buttercup *Ranunculus sceleratus*, marsh bedstraw *Galium palustre* and *Polygonum amphibium*. Several of these species were found nowhere else in the river.

Other waterside species occasionally found along the river were common reed *Phragmites australis*, gypsywort *Lycopus europaeus*, reed sweet grass *Glyceria maxima*, floating sweet grass *G. fluitans*, plicate sweet grass *G. plicata*, marsh dock *Rumex palustris*, yellow flag *Iris pseudacorus*, creeping bent *Agrostis stolonifera*, marsh foxtail *Alopecurus geniculatus* and greater reedmace *Typha latifolia*.

RESERVOIRS

The steep, managed sides of the reservoirs supported little waterside vegetation. The margins of the Stoke Newington Reservoirs had a mixture of wetland and disturbed ground species. Wetland species included common spike rush *Eleocharis palustris*, *Rumex hydrolapathum*, *R. palustris*, *Berula erecta*, *Typha latifolia*, *Rorippa sylvestris* and *R. palustris*. In contrast, Hornsey Reservoir had much larger stands of waterside vegetation especially around the southern edge. Species included *Iris pseudacorus*, *Carex acutiformis*, *R. hydrolapathum*, *Mentha aquatica* and *Polygonum amphibium*.

ENFIELD LOOP

Waterside vegetation was more common than in the New River, but it was still not abundant although within Enfield Park there were large, dense stands of *Sparganium erectum*, *Phragmites australis* and *Typha latifolia* together with smaller quantities of *Iris pseudacorus*, *Phalaris arundinacea*, *Mentha aquatica*, *Lycopus europaeus* and *Ranunculus sceleratus*. Many of the larger stands were probably derived from planted material.

Occasional, small stands of *Iris pseudacorus*, *Sparganium erectum*, *Typha latifolia*, *Lycopus europaeus*, soft rush *Juncus effusus* and great hairy willowherb *Epilobium hirsutum* were found elsewhere. Additionally, several species (*Glyceria maxima*, flowering rush *Butomus umbellatus*, arrowhead *Sagittaria sagittifolia*, marsh marigold *Caltha palustris* and *Iris pseudacorus*) were found in a very restricted area, often as single plants. It is believed they were planted by a local householder.

Macroinvertebrates

NEW RIVER

Overall seventy-eight macroinvertebrate taxa were found in the New River samples (Table 2; Appendix). The pattern of dominant macroinvertebrate groups from the vegetation in summer 1986 reflected the zonation shown by the aquatic macrophytes: a northern snail Gastropoda zone, a central black fly Simuliidae or mayfly Ephemeroptera larvae zone and a southern midge Chironomidae larvae zone (Table 3).

TABLE 2. Zonal distribution of macroinvertebrate taxa in the New River.

Macroinvertebrate Group	Zone			
	Northern	Central	Southern	All Zones
Trichoptera	10*	5	8	15
Gastropoda	12	6	12	14
Ephemeroptera	7	6	5	8
Bivalvia	7	4	5	7
Coleoptera	5	1	4	6
Oligochaeta	4	2	4	5
Diptera	4	4	3	5
Hirudinea	5	3	5	5
Hemiptera	2	1	3	3
Hydracarina	3	2	1	3
Amphipoda	1	2	1	2
Copepoda	1	1	1	1
Ostracoda	1	1	1	1
Isopoda	1	1	1	1
Cladocera	0	1	1	1
Megaloptera	1	0	1	1
TOTALS	64	40	56	78

*Number of taxa within macroinvertebrate group.

TABLE 3. Dominant macroinvertebrate taxa by section for New River vegetation and substrate samples.

Zone	Section	Vegetation		Substrate	
		Summer	Winter	Summer	Winter
Northern	5	Gastropoda	Gastropoda	Bivalvia	Gastropoda
Northern	11	Gastropoda	Gastropoda	Gastropoda	Gastropoda
Central	17	Simuliidae	n/v	Trichoptera	Chironomidae/ Oligochaeta
Central	22	Ephemeroptera	n/v	Trichoptera	Chironomidae/ Oligochaeta
Southern	27	Chironomidae	n/v*	Oligochaeta	Bivalvia
Southern	31	Chironomidae	n/v	Oligochaeta	Chironomidae

n/v = no vegetation.

*a small patch of *Callitriche hamulata* was sampled and was dominated by Trichoptera and Gastropoda.

The summer and winter substrate samples also showed a zonal pattern. The dominant taxa varied according to sampling time, but gastropods were the common dominant of the northern zone samples, as they were in the vegetation samples. Overall, the northern zone was the most species-rich and it had twenty-four more taxa than the central zone compared with only eight more than the southern zone (Table 2).

The most species-rich group were caddis-fly Trichoptera larvae. Of the fifteen taxa only *Hydropsyche pellucidula* was free-living, the other taxa were cased caddis. The majority of caddis taxa were found in low numbers with only *Anabolia nervosa* and *Agraylea* spp. locally abundant. The only taxa found throughout the river were *A. nervosa* and *Hydroptila* spp. Nine of the caddis taxa were found in a single zone and these were all absent from the central zone.

Fourteen gastropod taxa were recorded usually at low abundance. Jenkins' spire shell *Potamopyrgus jenkinsi*, however, was very abundant in the northern zone, representing 97% and 78% of gastropods in the summer and winter samples respectively. Wandering pond snail *Lymnaea peregra* and common pond snail *L. stagnalis* were found in moderate to high numbers. Only six taxa were found throughout the river and four were restricted to a single zone. Of the seven mussel Bivalvia taxa recorded, four were found in moderate to high numbers and two were restricted to the northern zone.

Eight mayfly larvae taxa were recorded, five were found throughout the river but the remaining three were restricted to a single zone. *Baetis fuscatus* and *B. scambus* larvae occurred in very high numbers in the central zone vegetation samples in the summer, representing 94% of the mayfly catch. However, neither species was recorded in the winter. *Centroptilum luteolum* was the only other mayfly to be found in high numbers. Mayfly larvae were associated with vegetation but *Caenis moesta* and *C. luteolum* were recorded from the substrate.

Blackfly larvae were found in high numbers in the central zone vegetation samples of summer 1986; 98% of blackfly larvae were in this zone. However, unlike mayfly larvae, they were recorded in high numbers in the winter in the northern zone vegetation samples. The two species recorded were found in mixed populations with *Simulium erythrocephalum* the dominant.

Five species of aquatic worm Oligochaeta were found generally in moderate to high numbers. With the exception of *Stylaria lacustris*, they were associated with substrate samples but most taxa were also recorded in vegetation. *Lumbriculus variegatus* was the only widespread species and *Peloscoides velutinus* the only species restricted to a single zone.

The remaining groups were found mostly in low numbers with generally fewer taxa in the central zone compared to the others. The exceptions were freshwater

shrimps Amphipoda (*Crangonyx pseudogracilis* was restricted to the central zone) and water-fleas Cladocera, which were absent from the northern zone.

RESERVOIRS

Forty-two taxa were recorded, twenty-three to twenty-nine occurring at individual sites (Table 4; Appendix). The vegetation of all three reservoirs was dominated by fly Diptera larvae; Hornsey and Stoke Newington West by Ephyridae, and Stoke Newington East by midge Chironomidae. The sediment

TABLE 4. Distribution of macroinvertebrate taxa in the reservoirs and Enfield Loop.

Macroinvertebrate Group	Reservoirs				Enfield Loop
	SNE*	SNW*	Hornsey	All	
Gastropoda	5†	3	8	10	4
Oligochaeta	5	5	5	7	3
Hirudinea	3	3	3	5	2
Trichoptera	3	2	2	4	0
Tricladida	0	0	3	3	1
Diptera	3	3	3	3	2
Amphipoda	1	1	1	2	1
Cladocera	2	1	0	2	0
Hydracarina	0	2	0	2	0
Isopoda	1	1	1	1	1
Copepoda	1	1	1	1	1
Ostracoda	1	1	1	1	1
Coleoptera	0	0	1	1	1
Odonata	0	0	0	0	2
Hemiptera	0	0	0	0	1
Bivalvia	0	0	0	0	1
TOTALS	25	23	29	42	21

*SNE/W = Stoke Newington East/West.

†number of taxa within macroinvertebrate group.

of the Stoke Newington reservoirs was dominated by oligochaetes, whereas, in Hornsey water slater *Asellus aquaticus* and *Crangonyx pseudogracilis* were dominant.

Ten gastropod taxa were recorded and they were generally found in low numbers, but bladder snails *Physa* spp., wandering pond snail *L. peregra* and white ramshorn *Gyraulus albus* were occasionally more numerous. Three taxa were found in all reservoirs and the other seven were restricted to a single site.

Oligochaetes were represented by seven taxa. The two Stoke Newington Reservoirs were dominated by *Potamothrix hammoniensis* and *Limnodrilus hoffmeisteri*, whereas Hornsey was dominated by *Lumbriculus variegatus*, which was absent from the Stoke Newington Reservoirs.

Five leech Hirudinea taxa were found but only two, *Helobdella stagnalis* and *Erpobdella octoculata*, were found in all three sites. Flatworms Tricladida were restricted to Hornsey. Water-fleas Cladocera were only recorded from the vegetation of the Stoke Newington sites, while water-mites Hydracarina were confined to Stoke Newington West.

ENFIELD LOOP

Twenty-one taxa were recorded (Table 4; Appendix). The vegetation was dominated by large numbers of gastropods, particularly button ramshorn *Anisus leucostoma*. The sediment was dominated by oligochaetes (notably *Limnodrilus hoffmeisteri*) and chironomids.

Gammarus pulex and *Asellus aquaticus* were abundant. This site was the only place in the study area where *G. pulex* was numerous. It was also the only site

where dragonfly Odonata larvae were found and one of the two sites (with Hornsey) with flatworms Tricladida.

Discussion

New River Aquatic Vegetation

The zonal nature of macrophyte distribution in the New River was a surprise considering the apparent homogeneity of the channel. A possible reason for the restricted distribution of *Berula erecta* was found in a central zone section where it was unusually abundant. Here the channel side supports were not visible and waterside vegetation was more abundant. This situation was common in the northern zone and suggests that *B. erecta* can only dominate where bank maintenance is low.

The central/southern zone boundary was associated with the outflow to Hornsey reservoir and the associated fall in discharge from 165Ml/day to 125Ml/day. The lower discharge to the south may have been the reason for the increased algal abundance. There was no obvious change in water quality at this point (Smith and George 1987).

Some of the aquatic plants found in the river are worthy of special note. One of the major finds of the survey was the widespread occurrence of *Oenanthe fluviatilis*, previously only recorded from twelve tetrads in the London area (Burton 1983). It is also nationally uncommon, being recorded in only 79 national tetrads (Palmer and Newbold 1983) and is declining both locally and nationally (Burton 1983; B. Wurzell pers. comm.).

Berula erecta is another uncommon species in London, particularly in the north-east, being recorded from thirty-one tetrads (Burton 1983). The charophyte *Nitella mucronata* was a very unusual find and is possibly the first record of this species in the London area (J. Moore pers. comm.). *Rumex palustris*, recorded from a single section near Enfield, is uncommon both in London and nationally (Burton 1983; Clapham *et al.* 1987). *Potamogeton pusillus*, recorded from a single section, is also uncommon in London (Burton 1983).

The *Callitriche* spp. are under-recorded in the London area, so it is not possible to evaluate the London distribution of these species. However, *C. hamulata* was not recorded in the nearby rivers, the Lee and Roding (Raven 1985; B. Wurzell pers. comm.).

The distribution of *Ranunculus penicillatus* var. *calcareus* in London is also uncertain because in Burton (1983) its recorded distribution is not separated from that of *R. peltatus*. However, it is fairly common in the nearby Roding and Lee (Raven 1985; B. Wurzell pers. comm.).

New River Macroinvertebrates

The macroinvertebrates showed zonal distribution patterns that mirrored the vegetation. This is not surprising considering that aquatic plants have a major influence on the aquatic environment. Overall the number of macroinvertebrate taxa found in the central zone was much lower than the other two zones. This could be related to the relatively low level of substrate cover in the central zone compared to the other zones.

The central zone was the main centre of the mayfly and blackfly larvae distributions, due possibly to the presence of *Sparganium emersum* without the abundant algae of the southern zone. These macroinvertebrates are known actively to seek certain current velocities, above and below which they do not settle (Osbourne *et al.* 1985). It may be that both *Berula erecta* and abundant algae affect the micro-current velocities so that these larvae do not settle.

Some groups, notably beetles, corixids, dragonfly and damselfly larvae, are either poorly represented in the New River or absent. This is probably related

to the paucity of waterside vegetation and the lack of diversity in the channel cross-section.

Some macroinvertebrates found in the New River are worthy of special note. Four of the mayfly species, *Procladius pseudorufus*, *Centroptilum pennulatum*, *Baetis scambus* and *B. fuscatus*, are considered uncommon in the London area (Aston and Andrews 1978; S. Brooks pers. comm.). The last two species are often referred to as *B. scambus* (agg.) and although this taxon was recorded in the nearby rivers, Roding and Lee, it was more abundant in the New River (Extence 1978; Bryce *et al.* 1978; Davis 1983; Raven pers. comm.). The other two species are both absent from the Roding and Lee.

The pea mussel *Pisidium hibernicum*, found in the northern zone, is a rare species for the London area and a surprising find in the New River (M. Kerney pers. comm.). *P. supinum*, also found in the northern zone, is a local species and Ball (1986) considers it to be more rare than *P. hibernicum*. The oligochaete *Peloscolex velutinus*, also found in the northern zone, is uncommon in the London area (Aston and Andrews 1978), although it has been found in small numbers in the Roding and Lee (Raven pers. comm.; M. Furze pers. comm.).

Reservoir Flora and Fauna

The aquatic macroinvertebrate fauna of Hornsey Reservoir was distinctly different from that of the Stoke Newington Reservoirs. The greater number of gastropod taxa, the presence of flatworms and the dominance of the sediment by different groups may have been related to the much greater abundance and diversity of vegetation in Hornsey.

Both *Potamogeton pusillus* and *P. berchtoldii* were found in the reservoirs and these are uncommon in London (Burton 1983). *Rumex palustris* and *Berula erecta*, both uncommon in London, were found in small amounts around the Stoke Newington Reservoirs.

However, the major ecological interest of these reservoirs is undoubtedly their wintering and moulting duck populations, which are important in the London area (White 1986; N. Bowman pers. comm.).

Enfield Loop Flora and Fauna

Both the aquatic flora and fauna of the Enfield Loop were characterised by high abundance and low diversity. For example, the flora was dominated by very large quantities of just two taxa, *Lemna gibba* and *Cladophora* spp. while most of the fauna comprised very high numbers of gastropods and in particular, *Anisus leucostoma*.

Conclusion

This study showed that the New River had a diverse aquatic flora and fauna. Several of the species recorded are rare or uncommon in London. The reasons for this are no doubt related to the high water quality together with a moderate and consistent flow. These were maintained by Thames Water Authority because the New River was a potable water aqueduct. The zonal distribution of aquatic macrophytes suggests that minor differences in channel management, even in an apparently homogenous system, can result in major differences in aquatic flora and fauna.

Postscript

In 1987 T.W.A. decided that they will abstract water from the New River near Maiden's Bridge (TQ344987), about three miles south of Cheshunt, and not build the treatment works at Cheshunt. They plan to retain the portion of the

New River south of this point as a wildlife and amenity resource. However, the discharge of the River will be reduced (to a minimum of one third of the present level) and water depths maintained by check weirs.

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APPENDIX

The occurrence and maximum abundance of macroinvertebrate taxa in the New River, reservoirs and Enfield Loop (relative abundance: – absent; L=low (1-5 individuals/sample); M=moderate (6-14); H=high (15-49); V=very high (>50)).

Macroinvertebrate Taxa	New River Zone*			Reservoirs†			Enfield Loop
	S	C	N	SNE	SNW	HOR	
TRICLADIDA							
<i>Polycelis tenuis</i>	—	—	—	—	—	L	—
<i>Dugesia polychroa</i>	—	—	—	—	—	L	L
<i>Dendrocoelum lacteum</i>	—	—	—	—	—	L	—
GASTROPODA							
<i>Valvata piscinalis</i>	L	L	L	L	L	L	—
<i>Potamopyrgus jenkinsi</i>	M	L	V	—	—	—	—
<i>Bithynia tentaculata</i>	L	L	L	—	—	L	L
<i>Bithynia leachi</i>	—	—	—	—	—	L	—
<i>Lymnaea stagnalis</i>	—	—	M	L	—	—	N
<i>Lymnaea auricularia</i>	L	L	L	—	—	L	—
<i>Lymnaea peregra</i>	H	L	M	L	L	M	—
<i>Physa fontinalis</i>	—	—	L	—	—	—	—
<i>Physa</i> spp. (not font.)	L	—	L	—	—	M	—
<i>Planorbis carinatus</i>	L	—	—	L	—	—	—
<i>Anisus leucostoma</i>	—	—	—	—	—	—	V
<i>Anisus vortex</i>	L	—	L	—	—	L	—
<i>Bathyomphalus contortus</i>	L	—	L	—	—	—	—
<i>Gyraulus albus</i>	L	L	L	L	M	L	—
<i>Armiger crista</i>	L	—	—	—	—	—	—
<i>Planorbarius corneus</i>	—	—	—	—	—	—	H
<i>Ancylus fluviatilis</i>	L	—	L	—	—	—	—
BIVALVIA							
<i>Sphaerium corneum</i>	L	L	H	—	—	—	L
<i>Pisidium amnicum</i>	L	L	L	—	—	—	—
<i>Pisidium casertanum</i>	V	L	L	—	—	—	—
<i>Pisidium subtruncatum</i>	V	—	L	—	—	—	—
<i>Pisidium supinum</i>	—	—	L	—	—	—	—
<i>Pisidium henslowanum</i>	M	L	L	—	—	—	—
<i>Pisidium hibernicum</i>	—	—	L	—	—	—	—
OLIGOCHAETA							
<i>Chaetogaster diaphanus</i>	—	—	—	L	L	—	—
<i>Stylaria lacustris</i>	M	M	—	L	M	—	L
<i>Tubifex tubifex</i>	—	—	—	M	L	L	—
<i>Limnodrilus hoffmeisteri</i>	H	—	L	H	M	L	M
<i>Limnodrilus udekemianus</i>	—	—	—	—	—	L	—
<i>Pelosclex velutinus</i>	—	—	M	—	—	—	—
<i>Potamothenrix hammoniensis</i>	M	—	M	H	H	L	L
<i>Lunbriculus variegatus</i>	H	H	M	—	—	M	—
HIRUDINEA							
<i>Piscicola geometra</i>	L	—	L	—	—	L	—
<i>Theromyzon tessulatum</i>	L	—	L	L	—	—	M
<i>Hemiclepsis marginata</i>	—	—	—	—	L	—	—
<i>Glossiphonia complanata</i>	L	L	L	—	—	—	—
<i>Helobdella stagnalis</i>	L	L	L	L	L	L	L
<i>Erpobdella octoculata</i>	L	L	L	L	L	L	—
HYDRACARINA							
Sperchonidae	—	—	L	—	—	—	—
Lebertiidae	—	L	L	—	—	—	—
Limnesiidae	—	—	—	—	L	—	—
Hygrobatidae	L	L	L	—	—	—	—
Arrenuridae	—	—	—	—	L	—	—
CLADOCERA							
<i>Sida crystallina</i>	—	—	—	L	—	—	—
<i>Eurycerus lamellatus</i>	L	M	—	L	M	—	—
OSTRACODA							
	L	L	L	L	L	L	L
COPEPODA							
	L	L	L	L	L	L	L

Macroinvertebrate Taxa	New	River	Zone*	Reservoirs†			Enfield Loop
ISOPODA							
<i>Asellus aquaticus</i>	H	M	L	L	L	H	H
AMPHIPODA							
<i>Gammarus pulex</i>	L	L	L	–	–	–	H
<i>Crangonyx pseudogracilis</i>	–	L	–	–	L	H	–
<i>Corophium curvispinum</i>	–	–	–	L	–	–	–
EPHEMEROPTERA							
<i>Baetis fuscatus</i>	L	V	L	–	–	–	–
<i>Baetis scanbus</i>	L	V	L	–	–	–	–
<i>Baetis rhodani</i>	–	–	L	–	–	–	–
<i>Centropilum luteolum</i>	M	M	H	–	–	–	–
<i>Centropilum pennulatum</i>	L	L	L	–	–	–	–
<i>Cloeon dipterum</i>	–	–	L	–	–	–	–
<i>Procloeon pseudorufulum</i>	–	L	–	–	–	–	–
<i>Caenis moesta</i>	L	L	L	–	–	–	–
ODONATA							
<i>Aeshna cyanea</i>	–	–	–	–	–	–	L
<i>Aeshna mixta</i>	–	–	–	–	–	–	L
HEMIPTERA							
<i>Notonecta maculata</i>	–	–	–	–	–	–	L
<i>Sigara dorsalis</i>	L	–	L	–	–	–	–
<i>Sigara falleni</i>	L	–	–	–	–	–	–
Nymphs indet.	H	L	L	–	–	–	–
COLEOPTERA							
<i>Halplus fluvialis</i>	L	–	L	–	–	L	–
<i>Hyphydrus ovatus</i>	–	–	–	–	–	–	L
<i>Deronectes depressus</i>	L	–	L	–	–	–	–
<i>Platambus maculatus</i>	–	–	L	–	–	–	–
<i>Elmis aenea</i>	L	–	L	–	–	–	–
<i>Limnius volckmari</i>	–	L	–	–	–	–	–
<i>Oulimnius tuberculatus</i>	L	–	L	–	–	–	–
MEGALOPTERA							
<i>Sialis lutaria</i>	L	–	L	–	–	–	–
TRICHOPTERA							
<i>Holocentropus dubius</i>	–	–	–	–	–	L	–
<i>Hydropsyche pellucidula</i>	–	–	L	–	–	–	–
<i>Agraylea</i> spp.	H	L	–	L	L	M	–
<i>Hydroptila</i> spp.	L	L	L	L	L	–	–
Limnephilidae indet.	L	–	–	L	–	–	–
<i>Limnephilus lunatus</i>	–	–	L	–	–	–	–
<i>Anabolia nervosa</i>	M	L	H	–	–	–	–
<i>Halesus digitatus</i> (agg.)	–	–	L	–	–	–	–
<i>Molanna angustata</i>	L	L	–	–	–	–	–
<i>Athripsodes aterrinus</i>	L	–	L	–	–	–	–
<i>Athripsodes cinereus</i>	–	L	L	–	–	–	–
<i>Mystacides nigra</i>	–	–	L	–	–	–	–
<i>Mystacides azurea</i>	L	–	–	–	–	–	–
<i>Oecetis lacustris</i>	L	–	–	–	–	–	–
<i>Goera pilosa</i>	–	–	L	–	–	–	–
<i>Sericostoma personatum</i>	–	–	L	–	–	–	–
DIPTERA							
Ceratopogonidae	L	L	L	L	L	L	L
Chironomidae	V	H	H	H	M	L	H
<i>Wilhelmia equinum</i>	–	H	H	–	–	–	–
<i>Simulium erythrocephalum</i>	–	H	H	–	–	–	–
Ephydriidae	L	–	–	L	H	H	–

*New River Zones (S=southern; C=central; N=northern)

†Reservoirs (SNE=Stoke Newington East; SNW=Stoke Newington West; HOR=Hornsey)

The Red Alga *Thorea ramosissima*: its Distribution and Status in the Thames Catchment

by DAVID M. JOHN*, LESLIE R. JOHNSON* and JENNY A. MOORE*

Abstract

Thorea ramosissima has been rediscovered in the River Thames after a lapse of almost 140 years. It has now been observed at 13 localities between Oxford and Teddington whereas Walton-on-Thames was its only known locality in the 1840s. This red alga is also reported from the Lea, a tributary flowing into the tidal Thames. The macroscopic stage in its life-history is transient, often remaining undetected when known localities are subsequently revisited. Nineteenth century collections from the British Isles are assessed and its ecology and morphology discussed.

Introduction

Thorea ramosissima is a freshwater rhodophyte (red alga), mostly purplish-black, but sometimes reported to be olive-green or brownish in colour, and frequently grows to a metre or more in length. It is slightly gelatinous, flexible, thread-like, sparingly to profusely branched, with a felt-like covering of deeply pigmented assimilatory filaments (Figure 1). The plant reproduces by fragmentation of the thallus and by means of monospores which arise on the peripheral filaments. These spores germinate immediately on release into a minute filamentous plant known as the *Chantransia*-stage. This alternate stage in the life-history is blackish to reddish in colour, forms hemispherical tufts or small felt-like patches, about 5mm or more in height, on a variety of surfaces including submerged aquatic plants. It is known to persist for long periods reproducing itself by means of monospores. Occasionally longitudinal axes arise laterally on the filaments and develop into the macroscopic stage. For a fuller account of this interesting alga, see Fritsch (1945: 738) and Swale (1962, 1963).

Distribution in the British Isles

Nineteenth Century Records

This red alga is not uncommon in Europe, but is very rare in the British Isles to judge from the few published records. In reporting it from Ireland Harvey (1841) stated (p. 120) 'Of this beautiful plant I have seen no British specimen. I introduce it on the authority of a note in the late Mr Templeton's MSS, whose well-known accuracy leaves no room to doubt his correctness in this instance, though he has not preserved a specimen in his herbarium'. This last statement is surprising in view of Pilcher's (1967) discovery of six specimens of *Thorea* in the manuscript volumes of Templeton's *Flora Hibernica*. The MSS and specimens are housed in the Ulster Museum, Belfast, and the specimens (accession numbers F42 to F47) are labelled in Templeton's hand 'From a boghole on the C. Donegall Mountains between Letterkenny and Dunfanaghy July 1815'. We have examined specimens F43 and F44 and found them to be a mixture of bryophytes and *Batrachospermum* (a red alga) without a trace of *Thorea* present. Harvey's faith in John Templeton's abilities would thus seem to have been somewhat misplaced.

William McIvor was the first to discover *Thorea* in the British Isles when in September 1846 he collected it from the bed of the River Thames, just upstream of the bridge at Walton-on-Thames (Figure 2). This site is about 25km upriver from the Royal Botanic Gardens at Kew where McIvor was an employee. He seems to have brought the alga to the immediate attention of Dr J. D. Hooker and his father, Sir W. J. Hooker, the then Director of the Gardens. William Harvey happened to be staying with the Hookers at the time and was evidently very interested in the find as can be deduced from a letter J. D. Hooker wrote

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FIG. 1. Showing some of the variation in form and size of specimens of the macroscopic stage of *Thorea ramosissima* collected from the River Thames in September 1984 at Cookham (Co), Shepperton (Sh), and Eton/Windsor (Ew). Scale bar, 20mm.

on 29 September 1846 (a Tuesday) to another eminent botanist, M. J. Berkeley, in which he states ‘..Harvey & I gathered abundance of *Thorea* last Saturday [26 September], at Walton on Thames, where it was discovered by my father’s glue man, McIvor. I have some splendid specimens for you & sent some fresh for Thwaites..’ (M. J. Berkeley Correspondence Collection in Botany Library, British Museum (Natural History), London). Harvey was one of the major figures in phycology in the middle years of the nineteenth century (Price 1988) and would already have been familiar with *Thorea ramosissima*; it is briefly described in his book, *A Manual of the British Algae* (Harvey 1841). The discovery of ‘This beautiful and highly curious fresh-water *Alga*’ in the River Thames was reported the following year in the *London Journal of Botany* (Anonymous 1847), possibly by the then editor of the journal who was none other than Sir W. J. Hooker.

McIvor’s own specimens of *Thorea ramosissima* are amongst 18 in the Herbarium of the British Museum (Natural History) which were collected in the last century from the Thames. Seventeen are from or near the bridge at Walton-on-Thames; all are believed to have been collected within the same period although a few are undated. Three specimens are labelled September 1846, with one plant so long (>1m) that it has had to be mounted on two sheets. McIvor’s name appears on all these sheets although J. D. Hooker and Harvey are known to have made a collection on 26 September 1846 (see Hooker’s letter to Berkeley mentioned above). Some of the undated specimens may have been collected on that occasion as the labels are written variously in the hands of Harvey and Hooker. Two specimens were collected in September 1847 and bear the name McIvor on the accompanying label. There are also two specimens mounted on bluish-tinged paper and labelled in the same hand, one is dated 10 June 1847 and the other 10 June 1848. Another Walton specimen has ‘Mr Borrer’ written in pen on its label. This would be William Borrer Jr, who is known to have collected it in this locality from a statement in a letter Mr J. W. Salter wrote to Berkeley on 3 August 1848: ‘By Mr Borrer’s request I send you a drawing of *Thorea ramosissima*. I take it for granted he has sent you specimens..’.

A single specimen in the BM is labelled ‘Habitat near Weybridge bridge’. This locality was probably close to the confluence of the Thames and the River Wey, about 3km upriver from the bridge at Walton-on-Thames. In pencil on the sheet is writted ‘Discov[er]ed in the Thames by Mr W. McIvor. Sept 1846’. It is uncertain as to whether this refers to the provenance of this particular specimen or is a general comment. The exchange of specimens was common practice between leading botanists of the day. Harvey and the Hookers exchanged widely so that *Thorea ramosissima* from the Thames became distributed in many private herbaria. For example, the well known phycologist John Ralfs of Penzance commented in a letter he wrote to Berkeley on 21 October 1846 that ‘..I returned Ilfracombe yesterday and found about 20 letters and parcels. One from Harvey contained British specimens of *Thorea ramosissima*’. There is a single BM slide of *Thorea* (BM12150), from the Ralfs collection, and scratched on its surface is ‘in the Thames Sept. 1846. Dr J. D. Hooker misit’. Other BM specimens also came originally from the private herbaria of well-known Victorian phycologists, including E. Jenner, E. M. Holmes, and E. A. L. Batters.

Twentieth Century Records

In 1980 the Freshwater Algae Section of the British Museum (Natural History) began a four-year survey of the composition and distribution of aquatic plants growing in the Thames. This study was confined to the freshwater river from its source in the Cotswold Hills (near Cirencester) to the lock and weir at Teddington below which it is tidal. A minute filamentous red alga was collected in August 1981 and August 1983 from leaves of the yellow water lily *Nuphar*

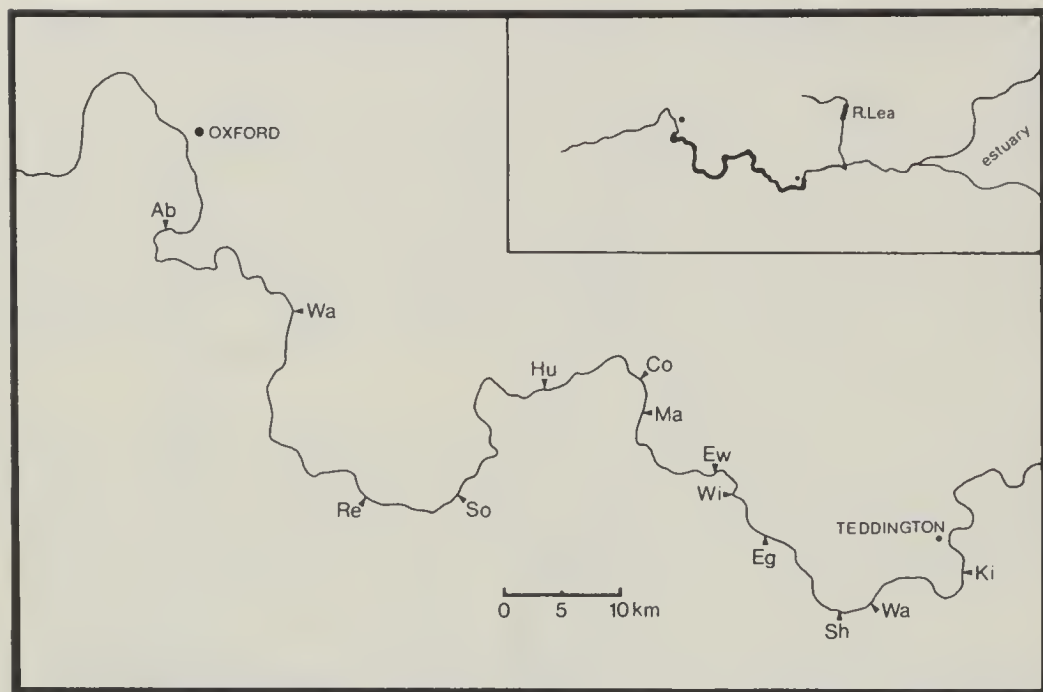


FIG. 2 *Thorea ramosissima*: its recorded distribution in the River Thames. Insert showing the *Thorea* stretch of the Thames and the River Lea indicated by a thicker line.

Key to localities: Ab, Abingdon, (SU506972); Wa, Wallingford (SU611895); Re, Reading (SU718741); So, Sonning (SU755757); Hu, Hurley (SU824843); Co, Cookham (SU899856); Ma, Maidenhead (SU901814); Ew, Eton/Windsor (SU968773); Wi, Albert Bridge, Windsor (SU984756); Eg, Egham, Bell Weir Lock (TQ017723, TQ018720); Sh, Shepperton (TQ074658); Wa, Walton-on-Thames (TQ093665); Ki, Kingston-upon-Thames (TQ177697).

lutea immediately upriver of Bell Weir Lock (John and Moore 1985). It was only positively identified as the *Chantransia*-stage in the life-history of *Thorea ramosissima* when the very distinctive macroscopic stage was discovered in September 1984 at several sites in the river. The distribution of the macroscopic stage was found to be very patchy and confined to a 133km long stretch between Oxford and Teddington (Figure 2).

Thorea ramosissima is also known from a 14km stretch of the River Lea (Swale 1963), a tributary whose confluence with the Thames is immediately downriver of the Isle of Dogs. This is the only other river in the British Isles from which it is reported. We visited the Lea in September 1984 and found a few small plants at King's Weir (Wormley, Hertfordshire), one of the original sites at which Belcher and Swale (1957) first found it in this river. They mention unsuccessfully searching for *Thorea* in the Thames at Walton-on-Thames as well as downriver at Molesey Weir. As far as we are able to ascertain, *Thorea* was not recorded from the time of Melvor's discovery in the 1840s until we rediscovered it after a lapse of about 140 years.

Discussion

Flow rate seemingly influences the growth and development of *Thorea ramosissima*. The longest (up to 1m) and most well-developed plants that we found were growing along the bank just below a weir at Cookham where the water was flowing rapidly through the open weir-gates. Water movement was considerably slower at all other '*Thorea*' sites and plants rarely reached a length of 25cm or more. Some collected at Walton-on-Thames in the 1840s are reported (Anonymous 1847) as 'attaining a length of 4 feet' and the population

was very luxuriant, to judge from the statement that 'at low water exposed to view abundantly, and when covered with clear water, showing itself as a vast gelatinous mass, of a purplish-black colour, yet exhibiting its filamentous internal structure...'. In September 1984 this alga grew on the river bed immediately upstream of Walton bridge, but individuals were widely scattered, difficult to detect, and frequently less than 25cm long. Conditions would therefore seem to have been more favourable for the growth of *Thorea* at this site during the period 1846-48 than at present.

The distinctive macroscopic stage is transient, often remaining undetected when known localities are visited on subsequent occasions. It is most commonly observed in the Thames between August and November with the majority of the specimens in the Herbarium at the British Museum (Natural History) collected in September. The most recent collections were made in September 1988 at Cookham and Maidenhead bridge with only a single plant detected at the latter locality when visited a month later. Its minute *Chantransia*-stage might easily be overlooked or mistaken for a similar filamentous stage produced by other freshwater red algae (e.g. *Batrachospermum*, *Lemanea*). *Thorea* grows on a wide variety of surfaces in the Thames and the River Lea: fishing line, concrete, stonework, brickwork, iron bridge supports, wooden posts, rocks, submerged branches and roots, and aquatic mosses such as the greater water-moss *Fontinalis antipyretica* and *Rhynchostegium riparioides*.

Thorea ramosissima is a distinctive red alga not uncommon in mainland Europe and yet reported from only two rivers in lowland Britain. It is impossible to know whether its distribution in the British Isles is truly very limited or merely a failure on the part of collectors to recognise the alga. We are keen to discover whether other populations exist and to this end would be pleased to receive specimens providing they are accompanied by accurate locality data.

Acknowledgements

We wish to thank Jim Price for making useful suggestions for improving the manuscript and providing information on nineteenth century botanists and their correspondence. Thanks are due also to Maura Scannell and John Lund for assisting in our quest for information on the distribution of *Thorea* in the British Isles. Special thanks go to Osborne Morton of the Ulster Museum, Belfast, who drew our attention to the existence of Templeton's '*Thorea*' specimens and for arranging the loan of material.

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Book Reviews

Nature Conservation in Croydon. By Deirdre Clenet, Bob Britton and Meg Game. 59pp., A4. £4.60. *Ecology Handbook* No. 9. London Ecology Unit. 1988. ISBN 1 871045 03 7.

Nature Conservation in Waltham Forest. By Robert Burley, Meg Game and Mathew Frith. 56pp., A4. £4.60. *Ecology Handbook* No. 11. London Ecology Unit. 1989. ISBN not given.

These two handbooks are numbers 9 and 11 respectively of the London Ecology Unit series of borough reviews which have so far covered Barnet, Brent, Greenwich, Hillingdon and Lewisham. The aim of the series is 'to promote planning for wildlife and for its enjoyment throughout the capital'. The wildlife sites of each borough are detailed according to their metropolitan or local interest. Also shown are those areas which are distant from any wildlife sites or where there is no access.

There is a contrast between the two handbooks, since while 55 sites are listed for Croydon only 25 are detailed for Waltham Forest. In part, this is due to the concentration in the latter area on the Epping Forest and Lea Valley sites. The Croydon Survey was completed before the 1987 storm damage and the authors admit there may be further research now required. It is the earlier changes and the current lack of any worthwhile ponds or rivers which has made the greatest change to the area. Perhaps more worrying still is the comment that the only green corridors in the borough are the railway lines. The review does not purely concentrate on the well known S.S.S.I.s of Happy Valley, Farthing Down and Riddlesdown, but instead a variety of smaller and more local sites.

In the Waltham Forest review there are not surprisingly more sites deemed to be of local interest only and thus two churchyards and two cemeteries are brought into review. However, the major areas of the borough are the Epping Forest and Lea Valley navigation sites and these are well detailed.

It is in fact the lesser sites as well as the general reviews of the areas that are the most informative since the major sites are normally well known. While the standards of publication are indeed high, it is for the range of sites detailed that I would more recommend members to purchase the volume for their local borough. I do not think members will be disappointed with these volumes and I am pleased to note that the Waltham Forest review includes a guide to the access, opening times, etc. for the sites of that borough.

H. M. V. WILSDON

Trees of the Countryside. By Alan Fairhurst and Eric Soothill. Blandford Press, London. 1989. 159pp. £6.95. ISBN 0 7137 2075 1.

As a recognition guide, this excellently produced book is superb. It takes us through an arboreal treat, family by family, with perfect line drawings depicting the shape of the particular species, and also those of its closely related brethren, a brief note of which accompanies these drawings. Coloured photographs of the bark, leaves, flowers and fruits are given thus making identification easy. All this is accompanied by text concerning general information, descriptions, and a most desirable feature, paragraphs on associated macro-fungi and insects.

Sixty-five well known British and northern European species are dealt with in this book, which is a must for the interested individual to take into the field. When I became interested in natural history, I commenced with trees, and I only wish there had been such a book as this in those days, and I have no hesitation in commending the book to you.

R. V. GOULDING

The Stoneworts (Charophyta) of Surrey

by JENNY A. MOORE,* and R. H. BAILEY**

Summary

The results of recent field studies on the charophyte flora of Surrey (V.C. 17) are presented, together with herbarium and literature records. It is suggested that habitat loss due to agricultural change and urbanization is, to some extent, counteracted by the emergence of new, man-made habitats which, combined with the changed status of the Basingstoke Canal, have created a situation where the charophyte populations of the county appear to be in a state of dynamic equilibrium.

Introduction

The Characeae (Charophyta), or stoneworts, have a chequered taxonomic history having been included, at one time or another, with the flowering plants, Equisetales and even the Bryophyta. Now, however, it is generally accepted that they should be placed in the green algae (Chlorophyta) as a single, albeit distinctive, family, the Characeae. In this paper the term Characeae (and charophyte as a vernacular name) is used in the sense adopted by Moore (1986), where a discussion of the nomenclature, taxonomic position, biology and ecology of the group can be found.

Charophytes have a unique vegetative structure (which can include some of the largest individual cells known in the plant kingdom) appearing superficially similar to the horsetails (*Equisetum* spp.). They also possess distinctive reproductive organs (oogonia and antheridia) and oospores. The latter are known from Silurian fossil deposits (demonstrating the ancient origins of the group). The similarity of fossilised oospores (gyrogonites) to those of the present day played a significant part in convincing the Victorian geologist Charles Lyell that geological changes consonant with the requirements of biological evolution had occurred (J. E. Prentice pers. comm.).

The Characeae are amongst the most neglected of macroscopic plant groups, not only in Britain but throughout the world. A preliminary atlas of their distribution in Britain and Ireland has been produced (Moore and Greenc 1983). However, only two British counties, Orkney (Moore 1985) and Gloucestershire (Moore and Bailey 1986), have published charophyte floras based, even in part, on recent fieldwork. Nonetheless increased interest is being shown in the family as their biological and ecological peculiarities become widely appreciated.

The Characeae are normally confined to clear, unpolluted, still, fresh or brackish waters. They appear unable to compete effectively with vigorous macroscopic vegetation and are, therefore, characteristic of the early stages in the succession of recently cleared or excavated ponds, canals and ditches or newly flooded mineral workings. The latter are an important habitat in parts of Surrey.

The work of the late G. O. Allen, a Surrey resident from 1933 until his death in 1963, has provided an important background to more recent studies. Allen collected extensively both within and without Surrey and many of his observations were published by the Haslemere Natural History Society (Allen 1950). His work in those parts of the county now comprising the Borough of Waverley built upon earlier studies made in that district by the brothers Henry and James Groves. The Frensham Ponds, so thoroughly studied by Allen,

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remain one of the most important sites in the county. However, recent studies on the Basingstoke Canal (part of which runs through Surrey but from where there appear to be few early records) have revealed the importance of this water body for a wide range of aquatic macrophytes, including charophytes, and it has now been accepted by the Nature Conservancy Council as one of the premier canal sites in Britain. Nonetheless, despite the excellence of some sites the situation in Surrey, as elsewhere, is not uniformly satisfactory. Many farm ponds have become redundant and been filled by human or natural agencies. Others are now shaded by the growth of bankside scrub and trees, making them unsuitable as habitats for the Characeae. Some water bodies have been lost through development or are being polluted by agricultural activities, including aquaculture. The greatly increased botanical value of the Basingstoke Canal is most probably the result of its abandonment as a working canal; the possibility that it will be developed for recreation, with a consequent increase in use by leisure craft, is a matter of concern for all those interested in its aquatic flora.

Despite these losses, the production of new water bodies, often as a result of mineral winning and the continued existence of certain sites of historic importance for their charophyte flora (many of which are, by chance, protected as common land or as National Trust property), have created a situation in which the status of the Characeae in Surrey seems to be one of dynamic equilibrium. The Surrey collections of the Groves brothers and G. O. Allen, including many specimens sent to them for determination (all now in B.M.), together with those records listed in the *Flora of Surrey* (Salmon 1931) summarize a great deal of the work carried out in the late nineteenth and first half of the twentieth century. These provide a broad base from which to assess the increasing number of records of recent years. Lousley (1976) and Leslie (1987) did not include charophytes in their accounts of the Surrey flora although the former is invaluable as a source of general information on the county.

In the list that follows records for each species are listed with the 10km grid square in bold type followed by localities within that square arranged in chronological order and by the name of the collector. A number of records made in 1975 by members of a University of London Extra-Mural course, held at Haslemere Educational Museum and led by R. H. Bailey, A. C. Jermy and J. A. Moore, are indicated by the abbreviation ULEM. Two of the entries are annotated as being 'doubtful records'. The specimen of *Nitella gracilis* was, according to Allen (1950), just 'a scrap' and the record is not included in Groves and Bullock-Webster (1920). On the other hand the specimen of *Nitellopsis obtusa* is a fine example of that rare taxon but there is doubt as the provenance of the material – '... other plants having appeared suddenly in the pool below Walton Bridge, suggesting the possibility of intentional introduction' (Groves and Bullock-Webster 1924).

Records of Surrey Characeae

Records from all parts of the county of Surrey (V.C. 17) are listed. In some instances several herbarium specimens of the same species exist (usually in the B.M.), all of which were collected on the same date, at one site, and which also correspond with literature records. In these circumstances only one record is included. Where habitat or month of collection is not specified this information is absent from the herbarium sheet or literature. Habitat is not repeated where it is included in locality details. Some records have been previously published by Salmon (1931).

All records made since 1972 have been determined or confirmed by the authors. Earlier records would, by and large, have been seen by G. O. Allen, Canon G. R. Bullock-Webster or the Groves brothers. There is no evidence that the majority of records in Salmon (1931) were examined by these experts.

All records included here have been passed to the Biological Records Centre of I.T.E. (Biological Records Centre, Monks Wood Experimental Station, Abbots Ripton, Huntingdon, Cambs., PE17 2LS). The nomenclature follows Moore (1986).

Chara aspera

41/84: Frensham Little Pond, vi. 1881, W. H. Beeby, ix. 1881, H. Groves, ix. 1915, J. Comber, ix. 1923, C. E. Salmon, vii. 1975, ULEM; Frensham Great Pond, ix. 1883, H. Groves, viii. 1887, F. H. Ward, viii. 1916, J. Comber, viii. 1920, C. E. Salmon, vii. 1933, J. E. Lousley, viii. 1946, G. O. Allen; Hankley Common, Tilford, pond, iii. 1891, E. S. Salmon; **41/95:** Basingstoke Canal, Pirbright and Woking, viii. 1877, H. Groves, vii. 1881, A. Bennett.

Chara globularis

41/85: Mytchett Lake, Farnborough, xi. 1973, S. R. Davey; **41/95:** Basingstoke Canal, Pirbright, vii. 1881, H. Groves; Basingstoke Canal, Brookwood, v. 1986, R. H. Bailey; **51/05:** Woking, —. 1880, A. Bennett; Sutton Place, Guildford, concrete pond, ix. 1979, S. Wenham; Pain's Hill, Cobham, lake, vii. 1987, M. S. Bingley; Basingstoke Canal, Maybury, x. 1988, C. Hall; Basingstoke Canal, east of Monument Bridge, x. 1988, J. E. Smith; **51/06:** Basingstoke Canal, Shearwater, x. 1988, C. Hall; **51/15:** near Cobham Lodge, pond, ix. 1817, collector unknown; Ashstead Common, —. 1875, J. Groves; Ashtead, pool, vi. 1891, H. & J. Groves; Leatherhead, pond, vi. 1882, H. & J. Groves; Great Bookham Common, pond, ix. 1929, J. E. Lousley; Bookham Common, new pond, viii. 1979, K. Page; **51/16:** Kingston, nursery water tank, x. 1880 & vii. 1881, G. Nicholson; **51/17:** Kew Gardens, ornamental water by palm house, viii. 1866, collector unknown; Kew Gardens, lake, viii. 1923, C. V. B. Marquand; **51/27:** Barnes Common, pond, vii. 1861, J. S. Mill; **51/34:** Outwood, pond, v. 1881, E. Straker; **51/44:** Shingle Barn, Edenbridge, pond, v. 1891, E. S. Salmon; Haxted Mill, Edenbridge, ix. 1892, E. S. Salmon.

C. globularis var. *virgata*

41/84: Frensham Little Pond, vii. 1881, W. H. Beeby, iii. 1891, C. E. Salmon; Frensham Great Pond, viii. 1946, G. O. Allen; **41/85:** Basingstoke Canal, between Mytchett and Frimley Green, ix. 1987, C. Hall; **41/94:** Wanborough, old brick pits, viii. 1916, J. Comber; **41/95:** Basingstoke Canal, Pirbright, vii. 1881, H. Groves; **51/05:** Bolder Mere, Wisley, x. 1988, N. F. Stewart; **51/07:** Staines, pond, x. 1964, B. Wurzell; **51/15:** Leatherhead, pool, vi. 1882, J. Groves.

Chara hispida

51/25: Great Pond, Gatton Park, viii. 1879, W. H. Beeby.

Chara vulgaris

41/84: Frensham Little Pond, vii. 1975, ULEM; **41/85:** Basingstoke Canal, Frimley Green, v. 1986, R. H. Bailey; **41/94:** Compton, ditch, iv. 1883, E. Straker; **41/95:** East Flexford, pond, ix. 1923, W. Biddiscombe; **51/06:** by River Thames opposite Shepperton, ditch, —. 1876, E. C. De Crespigny; **51/15:** Leatherhead, pool, vi. 1882, J. Groves; Fetcham Pond, Leatherhead, xii. 1963, Mrs Missen; **51/17:** Kew Green, pond, vii. 1904, H. S. Thompson; Ham Pits, gravel pit, vi. 1945, J. E. Lousley; **51/24:** Newdigate, ditch, vii. 1980, J. E. Smith; **51/25:** Buckland Green, Reigate, pond, ix. 1919, C. E. Salmon; **51/26:** Mitcham, pool, v. 1877, H. & J. Groves; Beddington Park, pond, x. 1986, R. H. Bailey; Mitcham Common, pond, viii. 1988, R. H. Bailey; **51/27:** Streatham Common, vii. 1880, R. Kennedy; **51/36:** top of Riddlesdown, Croydon, pond, iii. 1880, A. Bennett; **51/44:** near Haxted Mill, Edenbridge, ditch, v. 1891, E. S. Salmon.

C. vulgaris var. *contraria*

51/16: Walton-on-Thames, vii. 1887, W. H. Beeby.

C. vulgaris var. *longibracteata*

41/85: Basingstoke Canal, Frimley Green, v. 1986, R. H. Bailey; **51/15:** Leatherhead, pool, vi. 1882, J. Groves; **51/17:** Kew Gardens, tank, —. 1881, G. Nicholson; **51/44:** near Haxted Mill, Edenbridge, ditch, ix. 1892, E. S. Salmon.

C. vulgaris var. *papillata*

41/93: Enton, Godalming, bog, —. 1952, B. Grindell *et al.*; **51/04:** Albury, newly constructed trout lakes, vi. 1988, J. E. Smith *et al.*; **51/15:** Effingham, pond, vi. 1905, A. H. Wolley-Dod.

Nitella flexilis s.l.

41/83: Shottermill, pond, —. 1966, collector unknown; **41/84:** River Wey, Pierrepont, Farnham, —. 1942, Capt. Diver; Frensham Great Pond, x. 1945 & vii. 1946, L. C. Lyon

and G. O. Allen, iv. 1946 & v. 1949, G. O. Allen; Curran Pond, Farnham Park, x. 1985, C. Hall; Thundry Meadows, Elstead, new pond, v. 1988, C. Hall; **41/85**: Mytchett Lake, Farnborough, xi. 1973, S. R. Davey; Basingstoke Canal, Great Bottom Flash, and between Mytchett and Frimley Green, ix. 1987, C. Hall; **41/86**: Royal Military Academy, Sandhurst, stream, vii. 1898, E. S. Marshall; **41/93**: Hill Farm, Haslemere, i. 1929, G. O. Allen; Haslemere, x. 1937, G. O. Allen; Inval, Haslemere, moat, iii. 1939, M. Dalglish *et al.*; Haslemere Museum, pond, xi. 1970, R. H. Bailey and A. L. Jewell, vii. 1975, ULEM, x. 1976, K. Holdom, vii. 1986 & ix. 1988, R. H. Bailey; **41/94**: Basingstoke Canal, Brookwood, v. 1894, E. S. Marshall; Basingstoke Canal, Cowshot Bridge, Pirbright, ix. 1987, C. Hall; Godalming, fishing lake, vii. 1988, R. H. Bailey; **51/03**: Vachery Pond, Cranleigh, viii. 1884, W. H. Beeby; **51/04**: Peaslake, pond, viii. 1885, A. J. Crosfield; near Lockner Farm, Chilworth, stream, viii. 1918, C. E. Salmon; **51/05**: Woking Heath, pit, —. 1878, E. C. De Crespigny; Woking, canal*, vi. 1881, A. Bennett; Ockham Common, pond, v. 1896, J. Groves; Basingstoke Canal, Maybury, x. 1988, C. Hall; Bolder Mere, Wisley, x. 1988, N. F. Stewart; **51/06**: Basingstoke Canal, Byfleet, viii. 1985, S. Berrett; Basingstoke Canal, Sheerwater and New Haw, x. 1988, C. Hall; **51/13**: Ockley, iii. 1884, E. Straker; **51/15**: Ashstead Common, gravel pit, pool, vi. 1877, J. Groves; Ranmore Common, pond, vi. 1930, H. Montford and M. B. Turrill, vii. 1981, M. V. Marsden; Ashstead, ponds, v. 1986, J. A. Moore and R. H. Bailey; **51/16**: Epsom Common, pool, iv. 1910, J. Groves; Epsom Common, monastic stew pond, v. 1986, J. A. Moore and R. H. Bailey; Fairmile Common, Esher, pond, v. 1986, J. A. Moore and R. H. Bailey; **51/17**: Richmond Park, Ham Gate Pond, ix. 1929, C. V. B. Marquand; Richmond Park, Lost ponds, v. 1931, A. K. Jackson *et al.*; Richmond Park, v. 1934, G. O. Allen; **51/25**: Burgh Heath, pond, viii. 1980, M. V. Marsden; **51/26**: Mitcham Common, pond, iv. 1878, H. & J. Groves, iv. 1881, A. Bennett, ix. 1891, F. H. Ward, vi. 1924, D. G. Catcheside, ii. 1925, C. I. Paton; **51/27**: Wandsworth Common, pond, iv. 1819, J. F. Young, vi. 1877, H. & J. Groves; Wimbledon Common, pond, vi. 1878, H. & J. Groves; Barnes Common, viii. 1882, G. Nicholson; Queen's Mere, Wimbledon Common, viii. 1983, J. A. Moore and R. H. Bailey; **51/35**: Coulsdon, pond, vi. 1880, E. Straker; Chelsham Common, v. 1881, E. Straker, vi. 1884, H. T. Mennel; **51/36**: Chipstead, pond, ix. 1879, J. Groves.

Nitella gracilis

51/16: Kingston, nursery water tank, x. 1880, G. Nicholson (doubtful record).

Nitella mucronata

41/84: River Wey, Frensham, x. 1936, G. O. Allen.

N. mucronata var. *gracillima*

41/95: Basingstoke Canal, west of Pirbright Bridge, viii. 1988, J. E. Smith; **51/06**: Basingstoke Canal, Byfleet, viii. 1985, S. Berrett.

Nitella translucens

41/84: Blackwater Lake, Farnham, vi. 1950, D. F. Leney; **41/85**: Alphington Green, Frimley, pond, vi. 1979, S. Wenham; Mytchett Lake, Farnborough, viii. 1987, R. FitzGerald *et al.*; **41/94**: Royal Common, Milford, ditch, iii. 1891 & vi. 1892, E. S. Salmon; **41/95**: Brookwood, pool near Basingstoke Canal, ix. 1916, J. Comber; Basingstoke Canal, Brookwood, v. 1986, R. H. Bailey; **51/03**: Vachery Pond, Cranleigh, viii. 1884, W. H. Beeby; **51/04**: Shalford, pond, vii. 1986, R. H. Bailey; **51/05**: Woking Heath, pool, —. 1878, E. C. De Crespigny; **51/06**: Woking and Weybridge, canal*, vii. 1881, A. Bennett; Woking and Byfleet, canal*, v. 1893, E. S. Marshall; Byfleet, old bomb crater, ix. 1949, G. O. Allen; **51/15**: Ashted Common, gravel pit, vi. 1877, J. Groves; **51/16**: Epsom Common, viii. 1910, C. E. Britton; Epsom Common, monastic stew pond, v. 1986, J. A. Moore and R. H. Bailey; Epsom, pond in town, ix. 1986, R. H. Bailey; **51/34**: near Hedgecourt Pond, Felbridge, new pond, vi. 1979, J. A. Moore and R. H. Bailey; **51/36**: Shirley Common, Croydon, pool, iv. 1878, W. H. Beeby.

Nitellopsis obtusa

51/16: Walton-on-Thames, pool below bridge, vii. 1885, H. Groves (doubtful record).

Tolypella intricata

51/07: near Egham, ditch, v. 1886, W. H. Beeby, vi. 1886, H. Groves.

The three localities marked with an asterisk(*) are almost certainly the Basingstoke canal, although this was not clear from the data source.

A number of species recorded by Salmon (1931) are probably now extinct in the county. However, charophyte oospores can remain viable for long periods under adverse conditions. Allen (1950) records the abundant reappearance of charophytes in Frensham Great Pond when this area was re-flooded after

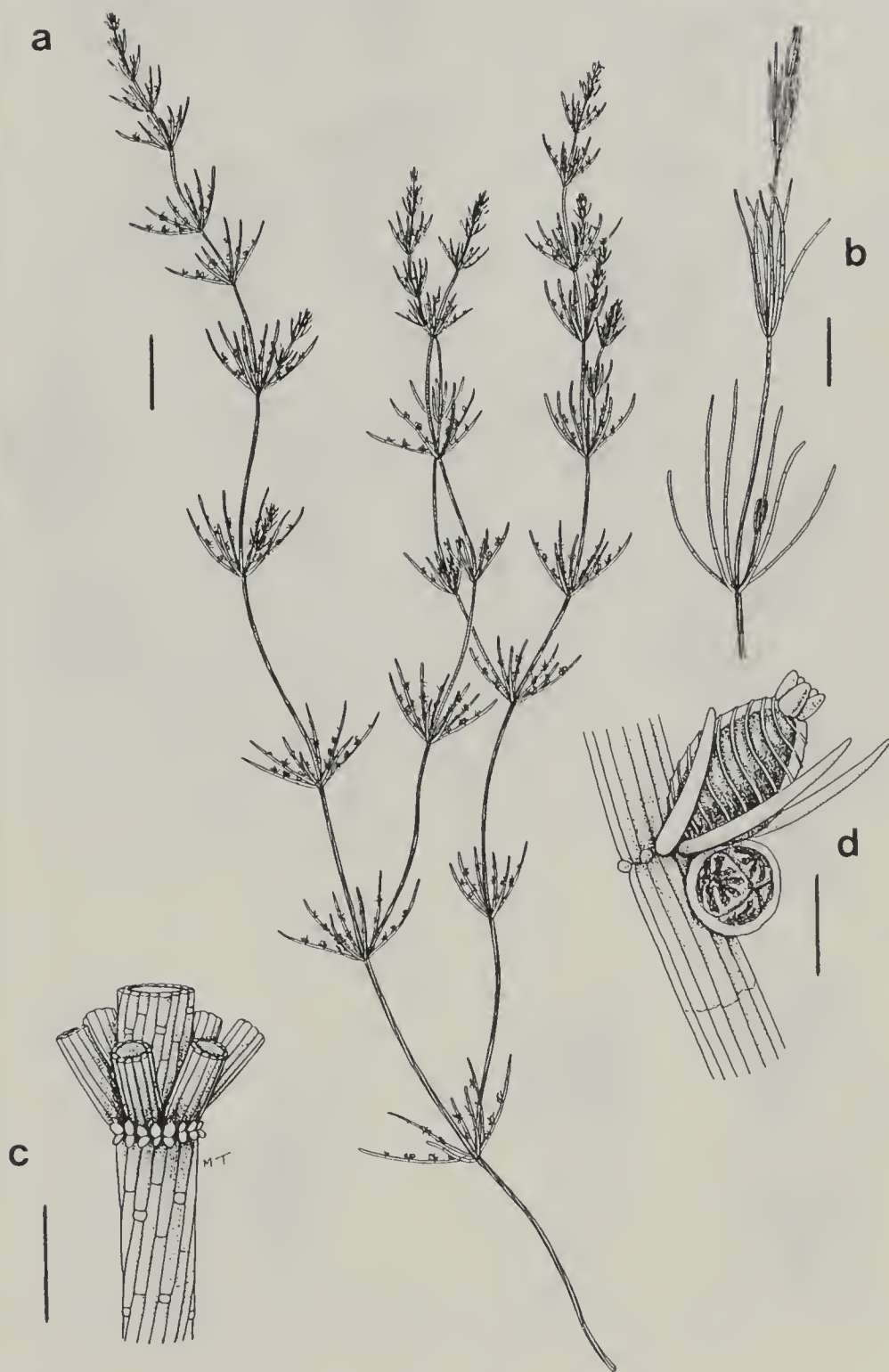


FIG. 1. *Chara globularis*. a & b, habits, scale bar - 10 mm. c, axis with branchlet whorl, scale bar - 1 mm. d, branchlet node with gametangia, scale bar - 0.5 mm.



FIG. 2. *Nitella flexilis*. a & b, habits, scale bar – 10 mm. c, branchlet apex with branchlet whorl, scale bar – 5 mm. d, branchlet apex with gametangia and two single – celled dactyls, scale bar – 1 mm.

drainage during the Second World War and Krause (1980) suggests that dormant spores, rather than the arrival of fresh spores, are responsible for the appearance of charophytes in man-made ponds on the flood plain of the upper Rhine. It is, therefore, difficult to say with certainty that charophytes are extinct at any site even if conditions have been unfavourable for several years.

The most frequently recorded taxon in the county appears to be *Nitella flexilis*. Salmon (1931) separates *N. opaca* from *N. flexilis* but the validity of this split has been questioned (Moore 1986) and the two taxa are listed here as *N. flexilis* s.l. The status of *N. flexilis* s.l. appears stable in the county.

One significant addition to the county flora in recent years is *Nitella mucronata* var. *gracillima* which was known from only one locality in Britain until the late 1940s. Since that time the plant appears to be on the increase with a steady trickle of records from southern Britain and as far north as Lancashire.

The status of a number of other species merits further comment. *Chara aspera* appears to be decreasing, the majority of collections having been made at the Frensham Ponds (the most recent in 1975). Despite recent work this species has not been recorded from the Basingstoke Canal for over a century. *Chara globularis* s.l. is the second most frequently recorded taxon. Salmon (1931) includes a substantial number of widespread localities for *C. fragilis* and *C. deliculata* (now *C. globularis* s.l., see Moore 1986). There are, however, relatively few recent records of this species and it may well be decreasing in Surrey. *Chara hispida* is rare in England south of the Thames and there is only one record from Surrey, made in 1879. It would seem that the extreme south of England does not have enough sites with the ideal combination of calcareous peat and clay, together with a constant depth of water. This species is, in fact, widespread where these particular conditions occur. *Chara vulgaris*, the most frequently recorded charophyte in Britain, is extremely widespread in Surrey and is thought to be fairly stable. *Tolypella intricata* is a rare charophyte often growing in ephemeral habitats as a winter or spring annual. For example, it was recorded in Gloucestershire from a horse's hoof-print (Moore and Bailey 1986). It is, therefore, easily missed by collectors. The Surrey site where it was found in May and June 1886 is not unusual as the species has also been collected from canals and ditches, usually following dredging in the previous year.

The status of all species recorded from Surrey is summarized in Table I.

TABLE 1. Summary of all Surrey records of Charophyta.

Species	Number of records from Surrey	Most recent record	Status
<i>Chara aspera</i>	14	1975	Decreasing
<i>C. globularis</i>	23	1988	Stable
<i>C. globularis</i> var. <i>virgata</i>	9	1988	Stable
<i>C. hispida</i>	1	1879	Probably extinct
<i>C. vulgaris</i> *	25	1988	Stable
<i>Nitella flexilis</i>	57	1988	Stable
<i>N. gracilis</i>	1	1880	Probably extinct
<i>N. mucronata</i>	1	1936	Indeterminable
<i>N. mucronata</i> var. <i>gracillima</i>	2	1988	Probably increasing
<i>N. translucens</i>	19	1987	Stable
<i>Nitellopsis obtusa</i> **	1	1885	Probably extinct
<i>Tolypella intricata</i>	1	1886	Probably extinct

*The varieties of *C. vulgaris* are included with the type as little reliable data are available for these variable taxa prior to 1950.

**This one record is probably a deliberate introduction to the county.

Such changes as can be detected in the frequency and distribution of Surrey's charophytes are most probably a reflection of the changes in the aquatic environment that have occurred throughout Britain since the 1950s. Surrey is,

however, fortunate in having large areas of common land, mostly acid heathland, substantial tracts of chalk grassland, heathland and woodland which are protected by conservation organisations. This undoubtedly provides a degree of stability not always found in densely populated and intensively managed areas.

Acknowledgements

We would like to thank the numerous landowners who have allowed access to their land and the many botanists whose records are incorporated in the text. One of us (R.H.B.) acknowledges with gratitude a grant from the British Ecological Society Small Ecological Projects Fund which helped to offset travelling expenses in 1986. The figures, by Margaret Tebbs, were adapted from those published originally by the Botanical Society of the British Isles, whose co-operation in reproducing them here is acknowledged.

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Book Review

Larvae of the British Ephemeroptera. A key with ecological notes. By J. M. Elliott, U. H. Humpesch and T. T. Macan. Freshwater Biological Association. Scientific Publication Number 49. 1988. 145pp., 54 text figures. £10.00. ISSN 0367-1887. ISBN 0 900386 47 9.

The Ephemeroptera (mayflies), are an important component of the freshwater ecosystem providing not only an abundant supply of food for fishes, but also acting as important indicators of environmental quality. In view of this latter factor, accurate identification of species becomes of paramount importance to the freshwater ecologist. Since the publication of the Freshwater Biological Association's key to larvae of Ephemeroptera in 1961, there have been two revisions, in 1970 and 1979. This third revision was started in 1984 but, sadly, Dr Macan died early in 1985. Drs Elliott and Humpesch have since then completely rewritten the text whilst further illustrative material has been contributed by Professor Mizzaro-Wimmer. The authors have further expanded this work by incorporating the results of many of their own researches into the ecology of the forty-eight British species and the result is a work of considerable importance to entomologists and freshwater biologists alike.

COLIN W. PLANT

Observations on the Seasonal Variation of a Macro-Invertebrate Community in an Epping Forest Stream

by S. BOREHAM*

Abstract

The macro-invertebrate benthos of an Epping Forest stream was sampled on eight occasions between March 1987 and January 1988. Selected physico-chemical characteristics were also investigated during the study period. The life-cycles of selected species are related to the variations in abundance observed. Seasonal changes in the community structure are investigated and the mean community structure is compared to that determined by previous work.

Introduction

Loughton Brook is a major tributary of the River Roding in south-west Essex, draining 6.65km² of the eastern slopes of the Epping Forest ridge. A 4km² section of the headwater catchment is covered by a large proportion of deciduous woodland. Boreham *et al.* (1988) investigated the mean macro-invertebrate community structure of Loughton Brook in October and November 1986 and identified three distinct community types. This study describes the seasonal variation of a macro-invertebrate community in lower Loughton Brook and compares the mean community structure to that found by Boreham *et al.* (1988).

Methods and Materials

On eight occasions between March 1987 and January 1988, three 30-second kick samples of the macro-invertebrate benthos and measurements of temperature, pH and conductivity were taken from one sampling station on lower Loughton Brook, at National Grid reference TQ419969. This sampling station corresponds to site 2 of Boreham *et al.* (1988). The kick-samples were taken from a stable gravel riffle using a net with a mesh diameter of 250µm and an opening 230 by 225mm, adapted from Macan (1958). The macro-invertebrates obtained were field sorted and identified to species where possible. Seasonal variation in abundance and the mean community structure has been investigated. A hydrobiological index of water quality, the BMWP score (National Water Council 1981) has also been applied to the data.

Results and Discussion

Selected physico-chemical characteristics were monitored during the study period. Water temperature varied seasonally with a maximum of 16.3°C in August and a minimum of 3.1°C in January. However, conductivity and pH varied with discharge, which in the Loughton Brook responds rapidly to rainfall. During times of low-flow (<0.005 m³/s) the mean conductivity was 604µmhos/cm with a mean pH of 7.44, while during spate conditions (>0.1 m³/s) mean conductivity fell to 352µmhos/cm and mean pH was 7.02.

The seasonal abundance of selected species, and variations in the BMWP score and community structure are shown in Figure 1. Most British species of stonefly take one year to develop from egg to adult. Adults of *Nemoura cinerea* emerging between March and June live for only a few days and lay eggs which

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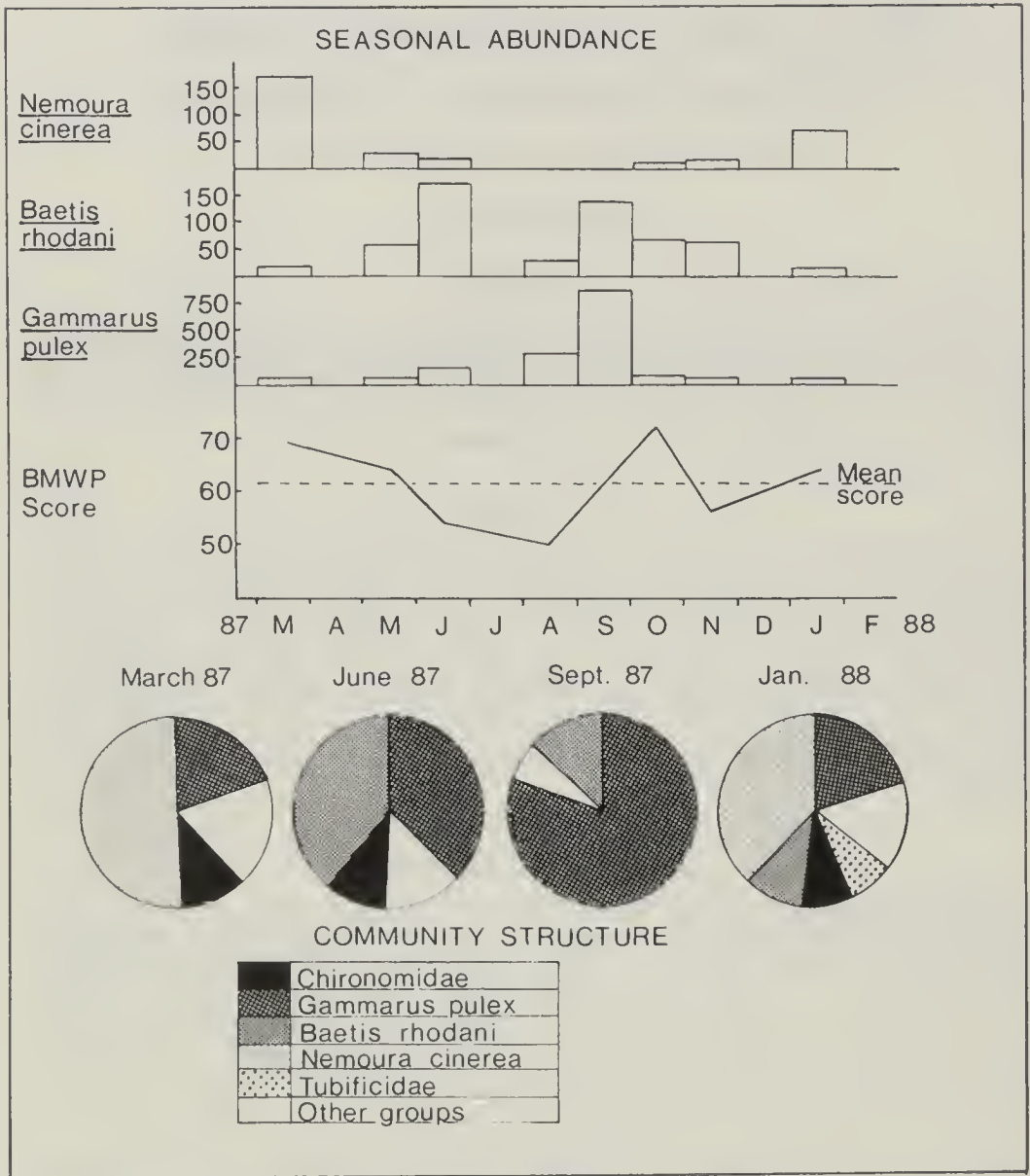


FIG. 1. Seasonal abundance (number of individuals) of selected species, and variations in the BMWP score and community structure over the study period.

may take several weeks to hatch (Hynes 1977). In August and September the young nymphs were too small to be captured by the sampling net, and so appeared to be absent until they began to exceed 250µm in October and November. The nymphs continued to grow throughout the winter and by March most were large enough to appear in samples. By contrast, the mayfly *Baetis rhodani* has two generations each year. Slow-growing nymphs over-winter, emerging as adults between April and June, while their faster-growing progeny emerge as adults in September and October (Macan 1977). As in the case of *N. cinerea*, young nymphs were not retained by the sampling net and so most nymphs were captured in June and September, immediately before their emergence as adults.

The numbers of the crustacean *Gammarus pulex* increased through the year reaching a peak in September. Welton (1979) found a similar pattern in a Dorset chalk stream, with a maximum abundance some ten times that observed during

the winter. However Macan and Mackereth (1957) found that numbers of *G. pulex* remained constant throughout the year in two becks in the English Lake District. Reproduction in *G. pulex* is continuous and individuals may live for up to 24 months so that generations overlap. Breeding activity is intensified in summer with most ovigerous females releasing their broods in July (Welton 1979). The peak observed in September was therefore due to the presence of newly recruited juveniles, immature individuals and adults which had recently bred. It is known that the adults die in late autumn, although spates during October probably resulted in mortality of all categories, and hence the low numbers subsequently captured.

As a result of seasonal changes in abundance, there were large variations in community structure over the study period (Figure 1). These may be tentatively divided into three seasonal phases: a winter phase characterised by a large number of *Nemoura cinerea*, a summer phase characterised by roughly equal numbers of *Baetis rhodani* and *Gammarus pulex*, and a shorter autumnal phase dominated by the abundant *G. pulex*. The only other groups consistently to exceed 3% of the community were the Chironomidae and Tubificidae. Of the remaining community, the leech *Erpobdella octoculata*, the molluscs *Potamopyrgus jenkinsi* and *Pisidium* sp., the crustacean *Asellus aquaticus*, the caddis fly *Limnephilus lunatus*, and members of the Tipulidae (crane-flies) occurred throughout the year.

Boreham *et al.* (1988) distinguished three community types by analysis of the less common invertebrate groups. Type (A) communities identified from lower Loughton Brook (including the site studied herein) were characterised by the presence of two species of leech (*Erpobdella octoculata* and *Glossiphonia complanata*) and three species of mollusc (*Potamopyrgus jenkinsi*, *Pisidium* sp. and *Lymnaea peregra*), and also by the restricted oligochaete and coleopteran fauna. Although the Oligochaeta and Coleoptera were well represented in type (B) communities, there were few molluscs or leeches, and the more acidic headwater tributaries were relatively species poor. Hildrew *et al.* (1984) found a similar relationship between pH and species richness in a number of streams in the Ashdown Forest. The mean community structure calculated from this study agrees well with community type (A) of Boreham *et al.* (1988). However some groups characteristic of type (B) communities were infrequently present, probably as a result of downstream drift in times of spate.

The BMWP score showed seasonal variation about a mean value of 61.4 as a result of fluctuations in the number of taxa (a minimum of 13 in August and a maximum of 18 in October). Changes associated with life-cycles and variations in water quality or micro-habitat availability could all affect the number of taxa present. Murphy (1978) suggested the average score per taxon (A.S.P.T.) as an index of water quality was less affected by seasonal variation. In Loughton Brook, deviation from the mean A.S.P.T. of 3.9 was small, indicating stable water quality throughout the study period.

Conclusions

The physico-chemical data collected suggest that the lower Loughton Brook has a relatively stable environmental regime, despite the rapid fluctuations in discharge which occur. The BMWP scores support the view that water quality in lower Loughton Brook remains fairly constant throughout the year. The macro-invertebrate community was dominated by *Gammarus pulex*, *Baetis rhodani* and *Nemoura cinerea*, whose life cycles cause marked seasonal variations in community structure. Despite these variations, the mean community structure was similar to community type (A) described by Boreham *et al.* (1988).

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Book Review

Climatic Change, Rising Sea Level and the British Coast. I.T.E. Research Publication No 1, Institute of Terrestrial Ecology/N.E.R.C. By L. A. Boorman, J. S. Goss-Custard and S. McGrorty. H.M.S.O. 1989. 24pp. £5.50. ISBN 0 11 701429 X.

The Greenhouse effect leading to rising sea levels has so far been portrayed as the lapping of waves over prime property and farmland; a retreat to the hills with the map of Britain shrinking as the sea encroaches. The purpose of this publication is to examine the effect on British coasts and coastal fauna of an increase in sea levels between 0.8 and 1.65 metres, these figures being taken as the current consensus rather than the extreme of up to 4.5 metres.

The variety and complexity of the changes are well detailed and it is this complexity with both winners and losers that is so interesting. While the effect on coastal features, cliffs, sand dunes, etc. is considered, there are intriguing sections on changes to mud-flat and salt-marsh vegetation, mud-flat invertebrates and coastal bird populations. These geographical and biological changes are all considered against four possible human reactions to the rising water levels: raising sea-walls, new landward sea-walls, new sea-defence barriers and simply the abandonment of the coastal areas.

Of more local interest the example chosen to show the effect of sea-level rise on salt-marsh vegetation is Dengie Marsh in Essex. Essex features several times and is clearly a county with considerable potential land loss. As to species loss or decline there are two species clearly threatened by the decline in the salt marsh. The redshank has half its breeding population on salt marshes and is thus vulnerable as is the twite. The current changes in brent goose feeding habits seem to have been extremely sensible although there will presumably be more confrontation with local farmers.

I can recommend this review for a thoughtful guide to the possible changes. The list of further studies required may profitably be studied by the Society's Research Sections. As a final point the authors state that the current considered cost of new defences against rising sea levels is £5 billion!

H. M. V. WILSDON

An Autumn Survey of the Aquatic Macro-Invertebrate Communities of the Concert Pond and Lily Pond, Kenwood, Hampstead Heath

by JEREMY BIGGS* and JOHN LANGLEY*

Summary

The aquatic macro-invertebrate communities of the Concert Pond and Lily Pond at Kenwood on Hampstead Heath were surveyed in November 1987. Both ponds supported low diversity communities, chironomid larvae accounting for a large proportion of the invertebrates collected. Analysis of community structure using a simple index of similarity (Jaccard's Coefficient) suggests that the macro-invertebrate communities of the two ponds were very similar in species composition. No nationally rare or local species were recorded.

Introduction

Langton (1985) estimated that there were still about 1,600 ponds in London's 400 square miles of urban and Green Belt land. However there have been few studies published of the aquatic macro-invertebrate communities of individual ponds. We report here the results of an autumn survey of the aquatic macro-invertebrates of two heavily silted ponds on Hampstead Heath.

The Concert Pond and Lily Pond (the 'Kenwood ponds') abut the northern edge of the Hampstead Heath Woods Site of Special Scientific Interest. The ponds are the uppermost of a series known as the Highgate Ponds and are almost due south of Kenwood House (Grid references: Lily TQ 271871, Concert TQ 272871). The ponds were created in the mid-eighteenth century, probably from older fish ponds, and are fed by springs rising south-west of Kenwood House. The Concert Pond is about 4000m² (0.4ha) in area and the Lily Pond about 7500m² (0.75ha). Both ponds are bounded by woodland on their southern shores. At the time of the survey the Lily Pond also had trees and woody shrubs (particularly rhododendrons) overhanging most of its margin. Large quantities of silt had accumulated in the ponds, particularly in the Lily Pond. The maximum depth of water in both ponds was about 4 metres. In the Concert Pond silt had accumulated to a maximum depth of 2m and in the Lily Pond to a maximum depth of 3m (English Heritage pers. comm.). The survey described here was carried out in November 1987 as part of the preparation for renovation work on the ponds.

Methods

Most of the work reported here was undertaken on 12 November 1987. A surface water sample was collected from the centre of both ponds and analysed for pH, conductivity, chloride, sulphate, nitrate, nitrite, ammonia and total hardness. The occurrence and distribution of aquatic vascular plants growing in and around the ponds was recorded in November and again on 6 August 1988.

Macro-invertebrates were collected using a 1mm mesh Freshwater Biological Association-pattern pond net. Before sampling began, zones of the pond which appeared to provide distinctive habitats for macro-invertebrates were identified (e.g. stands of yellow water lily *Nuphar lutea* roots and submerged branches of marginal willows and shaded margins). Five such zones were found in the Concert Pond and six in the Lily Pond.

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Invertebrate samples were collected during three minutes of vigorous hand netting. Sampling time was divided equally between each zone of the pond (for example with six zones, there was 30 seconds sampling in each zone). The material collected in each zone was pooled to give a composite three-minute sample. This procedure was repeated to obtain three replicate samples from each pond. Samples were taken back to the laboratory and macro-invertebrates removed for counting and identification, to species where possible.

Jaccard's Coefficient of Similarity was used to investigate aspects of macro-invertebrate community structure. Jaccard's Coefficient is a simple measure of the extent to which two habitats (or samples) have species in common (Southwood 1978). In this work it has been used in two ways. Firstly, to compare the similarity of replicate macro-invertebrate samples from the same pond and secondly to compare the similarity of the macro-invertebrate communities between the two ponds.

Results and Discussion

Water Chemistry

The water chemistry of the ponds was similar at the time of sampling (Table 1). Both ponds were slightly acid (Concert: pH 6.9, Lily: pH 6.2) with conductivities of 360 μ S/cm (Concert) and 340 μ S/cm (Lily).

TABLE 1. Water quality in the Concert and Lily Ponds, Kenwood.

Determinand	Concert	Pond Lily
All values mg l ⁻¹ unless otherwise stated (except pH).		
pH	6.9	6.2
Conductivity (microsiemens/cm)	360	340
Chlorides as Cl	15	15
Sulphates as SO ₄	Less than 0.1	15
Nitrate as N	0.05	0.04
Nitrite as N	0.01	0.01
Ammonia as N	0.42	0.33
Total hardness as CaCO ₃	125	115

Aquatic Plants

The aquatic plant communities of the two ponds were limited in diversity. The Concert Pond was fringed by a band of yellow water lily, up to 5m wide, and also supported a small stand of white water lily *Nymphaea alba*. We found no other large stands of water plants in this pond. The Lily Pond was dominated by an extensive stand of yellow water lily growing throughout the pond on deep silt. In some parts of the pond, water starwort *Callitriche* sp. was found growing in abundance amongst the lilies. Marginal emergent plants were scarce but three isolated stands of branched bur-reed *Sparganium erectum* were found. On 6 August 1988 the following species were also recorded: water mint *Mentha aquatica*, water forget-me-not *Myosotis scorpioides*, common duckweed *Lemna minor*, bittersweet *Solanum dulcamara*, New Zealand swamp stonecrop *Crassula helmsii*, water plantain *Alisma plantago-aquatica*, water pepper *Polygonum hydropiper* and gypsywort *Lycopus europaeus*.

Macro-invertebrate Community

For their size, the Kenwood ponds supported relatively species-poor macro-invertebrate communities. Twenty-nine macro-invertebrate taxa were found in the Concert Pond and 31 taxa in the Lily Pond. Table 2 lists the taxa found and shows their abundance in each composite sample collected from the two ponds.

TABLE 2a. Aquatic macro-invertebrates recorded in the Concert and Lily Ponds.
Kenwood, 12 November 1987.

	Concert Pond			Sample	Lily Pond		
	1	2	3		1	2	3
FLATWORMS (TRICLADIDA)							
<i>Polycelis tenuis</i>	1	—	—	—	—	1	
<i>Dugesia lugubris</i>	—	1	—	—	—	—	
<i>Dugesia polychroa</i>	—	1	—	—	—	—	
<i>Dendrocoelum lacteum</i>	1	2	—	1	2	2	
WORMS (OLIGOCHAETA)							
<i>Lumbriculus variegatus</i>	3	1	1	—	—	3	
<i>Ophidonais serpentina</i> (to be confirmed)	—	—	—	3	3	1	
<i>Linnodrilus claparedeianus</i>	—	—	—	1	—	—	
Tubificidae	1	—	—	1	—	—	
LEECHES (HIRUDINEA)							
<i>Erpobdella octoculata</i>	2	3	2	2	2	—	
<i>Glossiphonia heteroclita</i>	1	—	1	1	3	1	
<i>Helobdella stagnalis</i>	2	—	—	—	2	—	
<i>Hemiclepsis marginata</i>	—	—	—	—	—	—	
<i>Thermozon tessulatum</i>	—	—	—	—	1	—	
SNAILS (MOLLUSCA)							
<i>Valvata cristata</i>	2	6	3	1	2	1	
<i>Bithynia tentaculata</i>	4	3	1	—	—	—	
<i>Acroloxus lacustris</i>	—	—	—	—	—	7	
<i>Planorbis albus</i>	—	—	—	—	—	—	
<i>Planorbis carinatus</i>	—	—	—	—	—	—	
<i>Planorbis planorbis</i>	—	16	11	6	—	1	
<i>Planorbis vortex</i>	—	—	1	—	—	—	
<i>Planorbarius corneus</i>	—	—	—	—	—	—	
<i>Segmentina complanata</i>	—	—	—	—	—	1	
<i>Sphaerium corneum</i>	—	18	21	15	1	—	
<i>Sphaerium lacustris</i>	—	2	—	—	—	—	
SHRIMPS and SLATERS (CRUSTACEA)							
<i>Asellus aquaticus</i>	12	45	11	8	12	8	
<i>Asellus meridianus</i>	—	—	—	—	—	—	
<i>Crangonyx pseudogracilis</i>	22	29	10	32	36	38	
MAYFLIES (EPHEMEROPTERA)							
<i>Cloeon dipterum</i>	—	—	1	5	2	5	
ALDERFLIES (MEGALOPTERA)							
<i>Sialis lutaria</i>	1	1	3	—	—	—	
DRAGONFLIES (ODONATA)							
<i>Coenagrion puella</i>	—	—	1	1	—	—	
<i>Aeshna grandis</i>	—	1	—	—	—	—	
CADDIS FLIES (TRICHOPTERA)							
<i>Cynurus flavidus</i>	4	1	1	2	3	1	
<i>Glyptotaelius pellucidus</i>	6	4	4	—	2	2	
<i>Holocentropus picicornis</i>	—	—	1	—	—	1	
<i>Limnephilus flavicornis</i>	—	—	—	—	—	—	
WATER-BUGS (HETEROPTERA)							
<i>Hesperocorixa sahlbergi</i>	1	—	—	3	5	5	
<i>Sigara dorsalis</i>	—	—	—	1	—	2	
<i>Notonecta glauca</i>	—	—	—	—	2	1	
BEETLES (COLEOPTERA)							
<i>Hydroporus palustris</i>	—	7	9	5	—	1	
<i>Agabus sturmi</i>	—	—	2	—	—	1	
<i>Hyphydrus ovatus</i>	—	—	—	1	—	—	
TWO-WINGED FLIES (DIPTERA)							
Chaoboridae	—	—	—	—	—	—	

Chironomidae	86	38	26	67	152	127
<i>Dixella filicornis</i>	—	1	4	—	—	—
Psychodidae	—	—	—	1	—	—
Ptychopteridae	—	—	—	1	—	—

TABLE 2b. Additional species, with abundances, recorded in a fourth composite sample from the Lily Pond on 12 January 1988.

LEECHES (HIRUDINEA)

Hemicleipsis marginata 1

SNAILS (MOLLUSCA)

Planorbis albus 3

Planorbis carinatus 2

Planorbarius corneus 1

SHRIMPS AND SLATERS (CRUSTACEA)

Asellus meridianus 20

CADDIS FLIES (TRICHOPTERA)

Limnephilus flavicornis 11

TWO-WINGED FLIES (DIPTERA)

Chaoboridae 3

Comparison with results of pond surveys in other parts of the country indicate the extent to which the Kenwood macro-invertebrate communities were impoverished. For example, in a survey of a small pond (450m²) on Otmoor in Oxfordshire, Biggs and Langley (unpublished observations) found 56 macro-invertebrate taxa. The survey, carried out in August 1987, used the same methods as those described here. Similarly, a 500² pond at Castor Hanglands National Nature Reserve, near Peterborough, surveyed by Palmer (1973), supported about 100 macro-invertebrate taxa, although in this study samples were collected at several times during the year.

It is generally believed that the number of taxa to be found in ponds declines during the winter and it could be argued that the season of sampling reduced the number of taxa found in the Kenwood ponds. However, in a well-vegetated pond of 2500m² on the edge of Oxford, we have collected about 50 macro-invertebrate taxa in a single day during mid-winter (Biggs and Langley, unpublished observations). Approximately the same number of species can be found in this pond during the spring or summer.

The Kenwood ponds were notable for the small number of water-beetle species they supported. The shaded pond margins and steep banks (which prevented the development of marginal vegetation) were probably important factors limiting the number of species of water-beetles found.

No nationally rare or local macro-invertebrate species were recorded in the Kenwood ponds, although Macan (1969) described *Valvata cristata* only as 'fairly common'. It is associated with 'mud and running water, conditions usually found in thick weed beds'.

Chironomid midge larvae, which were not identified beyond family level, accounted for 34% and 58% of the total numbers of invertebrates collected in the Concert and Lily Ponds, respectively. Water shrimps *Crangonyx pseudogracilis* and water slaters *Asellus aquaticus* were the next most abundant group, jointly comprising 29% (Concert Pond) and 22% (Lily Pond) of all macro-invertebrates collected.

On the 12 January 1988 a fourth composite sample was collected from the Lily Pond. Seven species which had not been found in November were recorded in this sample. Although not included in the analysis they have been appended to the species list in Table 2b for completeness.

Similarity of Macro-invertebrate Communities

The two ponds supported 39 macro-invertebrate taxa altogether of which just

TABLE 3a. Calculation of Jaccard's Coefficient for the Kenwood ponds.

Jaccard's Coefficient of Similarity = Number of taxa common to both sites

$$\begin{aligned} & \frac{(\text{number of taxa at site A} + \text{number of taxa at site B}) - (\text{number of taxa common to both sites})}{21} \\ &= \frac{(29 + 31) - 21}{21} \\ &= 0.54 \end{aligned}$$

TABLE 3b. Jaccard's Coefficients for replicate samples from the Concert Pond and Lily Pond.

	Concert Pond				Lily Pond		
	1	2	3		1	2	3
1	—				—		
2	0.57	—			0.48	—	
3	0.52	0.54	—		0.44	0.44	—

over half (21) were found in both ponds. Jaccard's Coefficient for the two ponds was 0.54 (Table 3a). Pairs of composite samples from the same pond also had about half their taxa in common giving Jaccard's Coefficients of 0.44-0.48 (Lily) and 0.52-0.57 (Concert) (Table 3b). This suggests that the communities in the two ponds differed no more in their species composition than replicate samples from the same pond.

Studies in other parts of the country indicate that it is uncommon for adjacent ponds to have more than half their taxa in common (Friday 1987; Biggs 1988). Even though the Kenwood ponds had only 54% of their taxa in common this implies that their communities should be considered closely related since they differed no more from each other than replicate samples from the same pond.

Conclusion

There have been few published studies of the macro-invertebrate faunas of neglected ponds but they are generally assumed to support impoverished communities dominated by few species. In this paper we have shown that, in comparison to well-managed ponds, the communities of the Kenwood ponds were indeed impoverished. It should be possible for two ponds of the size of the Kenwood ponds collectively to support about 80 macro-invertebrate taxa. It will be of interest to resurvey the ponds following their planned renovation.

Acknowledgements

We would like to thank the School of Biological and Molecular Sciences, Oxford Polytechnic, and Hamlet Partnership (Aquatic Environmental Consultants) who provided facilities for this work. The World Wide Fund for Nature (W.W.F.) provided financial support for Dr Biggs during the writing of this paper. The survey was commissioned by English Heritage as part of a comprehensive background study of Kenwood.

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Book Reviews

British Naturalists' Association Guides. Mountain and Moorland by Brian Brookes, ISBN 1 85223 225 0; *Coast and Shore* by Brian Barnes, ISBN 1 85223 226 9; *Wildlife in Towns* by Ron Freethy, ISBN 1 85223 227 7; *Woodlands* by J. L. Cloudsley-Thompson, ISBN 1 85223 232 3; *Ponds and Streams* by John Clegg, ISBN 1 85223 233 1; *Fields and Hedgerows* by Brian Lee, ISBN 1 85223 234 X. All 128pp, £3.95. The Crowood Press, Ramsbury, Marlborough, Wiltshire, 1989.

These six volumes are all paperback editions of titles first published in 1985 and 1986 at £7.50 or £7.95 each. The *Guide to Woodlands* was reviewed in *L.N.* 65 (1986). These new editions are very welcome and very reasonably priced. In his Foreword to the series David Bellamy, President of the Youth Section of the British Naturalists' Association, compares this series of books with actually going into the field with the experts and learning at first hand from them. They are all presented in a way that takes the reader thoroughly into the subject, setting the scene on the many aspects relevant to the titles. All the volumes are profusely illustrated with fifty or more colour photographs and a greater number of halftones. As naturalists we will find the whole series of immense interest, but as Londoners (in the broadest sense) we should find *Wildlife in Towns* especially interesting. When we are on holiday the appropriate title in the series will find a place in our baggage to complement the relevant general field guide. They are not themselves field guides in any sense of the word, but they describe the habitats and their structure and the typical, and sometimes specialized, plants and animals to be found there. These are books that both the beginner and the experienced naturalist will find extremely informative.

The British Naturalists' Association is to be congratulated in producing this series.

K. H. HYATT

Turtles and Tortoises of the World. By David Alderton. Blandford Press, London. 1989. 191pp. £14.95. ISBN 0 7137 1970.2.

Another excellent Blandford natural history book fulfilling a need in the field of reptilian literature. The chelonian families are dealt with comprehensively, and there are numerous colour photographs showing impressively the patterns and markings, whilst black and white photographs complement these.

There are chapters on chelonians and humans, form and function, reproduction, and evolution and distribution with distribution maps in addition to the text concerning the families.

In the chapter on chelonians and humans, there are interesting references to chelonians in literature, whilst form and function deals with every fascinating aspect of just that. Reproduction is dealt with in depth. Of course, as the reader might expect, the chapter dealing with evolution appeals to your reviewer, and the origins of these reptiles are discussed. Their progress through geological time is traced through the fossil record of the Triassic, Jurassic and Cretaceous periods.

There is a useful appendix featuring tortoises and turtles of the world with their English and Latin names, families, etc. A helpful glossary of terms, a guide to further reading, and a well compiled index combine to make the book an instructive, informative and interesting item of reading, well worth the cost.

R. V. GOULDING

Turkish Crayfishes Thrive in a London Canal

by R. W. INGLE* and P. F. CLARK*

Summary

The Turkish crayfish *Astacus leptodactylus* has been introduced into waters in England and Wales and for some years has been known from two ponds in the London area. In 1986 specimens were caught at a third locality, Hampstead Road Lock in the Grand Union Canal, and the colony is now flourishing.

Expansion in crayfish farming has led to the introduction into the British Isles of a number of alien crayfish species. Of these the signal crayfish *Pacifastacus* (*Pacifastacus*) *leniusculus leniusculus*, a native of the western U.S.A. and Canada, is usually the subspecies chosen for culture. Large numbers of juvenile and adult signals have been imported into the British Isles, particularly during the 1970s and early 1980s. These were released mainly into closed waters in several hundred sites for farming although some were also introduced into the wild. Signals are particularly adept at leaving water and wandering considerable distances. This behaviour invariably led to escapes from crayfish farms and enabled signals further to colonise rivers and establish naturalised populations. Some biologists believe that signals will out-compete our native white-clawed crayfish *Austropotamobius pallipes*, but at present there seems no direct evidence that this is happening through interspecific interaction, although populations of our native species have been reduced in numbers or eliminated due to infection with crayfish plague *Aphanomyces astaci* introduced and carried by signals that are highly resistant to this fungus.

An additional threat to our native crayfish is the introduced Turkish or long-clawed crayfish *Astacus leptodactylus* recognised by having the distal part of the rostrum broadened and the body shell (carapace) with two distinct spine-ridges behind the eyes. The Turkish crayfish is common in many water bodies of Eastern Europe, and is particularly abundant in the U.S.S.R and Turkey where it is cultivated. This crayfish occurs as far west as France and has progressively displaced populations of the noble crayfish *Astacus astacus* from many of the western regions into which it has spread.

The Turkish crayfish has been introduced into waters in England and Wales on a number of occasions. Two London breeding colonies have been known for some years in ponds on Hampstead Heath and Clapham Common, and a third is established in Suffolk. In 1986 a few crayfish caught in Hampstead Road Lock in the Grand Union Canal, London, were submitted to the Natural History Museum where they were identified as the Turkish species. In February of this year (1989) Mr Albert Hayman of British Waterways presented the authors with a large collection of live crayfish of varying sizes (Figure 1) from the now flourishing population discovered when this lock was temporarily drained. There are several subspecies of the Turkish crayfish distinguished on very trivial features. The three known naturalised populations in the London area belong to the subspecies *salinus*, large specimens of which are recognised by their slightly curved claws.

At present it is difficult to evaluate the threat posed to our native species by this alien. The three known populations of Turkish crayfish in the London region occur in localities where our native species may never have been present. In parts of Europe the Turkish crayfish has ousted the noble crayfish and it seems likely that this situation could also occur in the U.K., if it becomes established in waters occupied by our native species. The Turkish crayfish grows

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FIG. 1. **Top** – A small sample of juvenile and adult Turkish crayfishes captured in February 1989 from Hampstead Road Lock.

Bottom – A female Turkish crayfish preens her eggs in preparation for their hatching in May/June. Photos: *Harry Taylor B.M.(N.H.) Photo Unit.*

faster, is more fertile, adapts better to temperature changes and can tolerate a wider range of pH than the white-clawed crayfish. It is able to exploit food resources more fully by being active both during day and night. However, the Turkish crayfish is susceptible to crayfish plague, a feature shared with other European species.

The Turkish crayfish is equal in taste to the related and highly esteemed European noble crayfish. In optimal conditions, established healthy stocks of Turkish crayfish may achieve growth rates that compare favourably with signals and thus provide U.K. farmers with a useful supplementary or alternative species for pond culture. Nevertheless, what may be advantageous to the crayfish farmer could possibly lead to the further demise of our native species, already greatly reduced as the result of river pollution.

Book Review

Grasshoppers and Allied Insects of Great Britain and Ireland. By Judith A Marshall and E. C. M. Hayes. Harley Books. Colchester. 1988. 252pp. £25.00. ISBN 0 946589 13 5. *Sound Guide to the Grasshoppers and Allied Insects of Great Britain and Ireland*. J. F. Burton, D. R. Ragge *et al.* Harley Books. Colchester. Audio cassette, duration 28 mins 3 secs. £5.75. ISBN 0 946589 22 4.

Publication of this book has no doubt been eagerly awaited by all who have searched in vain along the shelves of secondhand bookshops for a copy of Ragge's long out of print *Grasshoppers, Crickets and Cockroaches of the British Isles*. The orthopterist's need for a new reference work has been obvious for many years. Harley Books have produced, albeit a little late, this new work on materials of the highest quality.

Comparison with Ragge is inevitable. Most of the ground covered by Ragge is included in this book with added information in the systematic and distribution sections. There is also a section on earwigs. It is very pleasing that the underlying philosophy behind the book subordinates simple collecting to that of conservation and research. Further investment in the audio cassette completes the work with good quality recordings of the songs of all species.

The early chapters deal with classification and allied subjects, the information is clear without labouring the subject. Recent discussions on the subject are outlined for our enlightenment. Less usual is the chapter on pronunciation which should help us all to use the scientific names with some confidence. In addition the audio cassette includes recordings of Dr Ragge announcing the song of each species. The subject of pronunciation is therefore very adequately explained.

Many field guides and monographs published recently include a historical chapter. This book is no exception however, the coverage is, tantalisingly, brief. Anyone who has read Dr Benton's *Dragonflies of Essex*, and in particular his extensively researched historical section, will understand this comment. More detail, particularly an insight into the lives of the naturalists involved would have enhanced this section. It is surprising that in the British Isles this order of large and relatively obvious insects still awaited the discovery of five species in 1920. Most interesting among these is the scaly cricket which exists in one known colony on a shingle bar in southern England. Such occurrences, because of their isolation, are popular subjects for ecological research and for the same reason inspire much speculation over their origin.

A chapter on song and courtship is included with a rather short section devoted to song. This is understandable since the companion cassette more than adequately covers the subject. It must be said that the usefulness of the work could be seriously devalued for anybody unable to afford the additional expense of the cassette or if the cassette becomes separated from the book as happened with the records which accompanied Ragge's book. One further comment which I would like to make here is that many of us do not have

the perfect hearing required to recognise the songs of all species. A remedy for this may be the use of a device similar to a bat detector which converts high frequency sounds to those which are audible. Some guidance on frequency would be of great assistance here. Notwithstanding this application it does not seem unreasonable to expect a modern work of this nature to include information on frequency.

The amount of space devoted to various aspects of identification reflects the importance placed on this by the authors. Here lies the greatest drawback of this book. The keys, colour plates, descriptions and atlas are many pages apart. This is not uncommon, but I find it extremely annoying and time consuming to flick back and forth between various sections when identifying specimens. I understand that the keys must be separate but I see no reason why the description should not be placed opposite the appropriate plate and atlas. It does not appear that the book is intended as a field guide, but because it contains the most comprehensive information available, the temptation to take it into the field is compelling and ease of use would therefore enhance it. This I consider a great pity since the keys are clear and easy to use. The descriptions are comprehensive and the colour plates superb. This may sound like a tall order but Harley have gone a long way to achieving this in Hammond's *Dragonflies of Great Britain and Ireland*.

Considerable field work since the publication of Ragge's book has provided much new evidence relating to distribution and this is recorded on the very clear maps. Distribution on islands around our coasts is also included emphasising growing interest in this order. Detailed information regarding the precise breeding sites of some of the rarest species is also included. I find this worrying since avaricious collectors still exist, but I doubt if these details were included without careful consideration by the authors.

A comprehensive list of references is included which should keep the enquiring orthopterist busy for many winter evenings and the section devoted to earwigs is welcome and worthwhile since this type of publication often produces a burst of interest in less popular groups.

This is a carefully researched book which can be used as an accurate guide for identification of the British Orthoptera. It also contains sections which can be dipped into for casual informative reading. However, the size, layout and cost necessitate the acquisition of a field guide as a complement.

D. S. MARTIN

The Effects of Livestock Slurry Pollution on the Benthic Macro-invertebrate Fauna of a Clay Stream

by S. BOREHAM†*, A. R. HOUGH††* and P. BIRCH*

Abstract

The benthic macro-invertebrate fauna of a clay stream polluted by livestock slurry was investigated at eight Essex sites in October 1985, April 1987 and October 1988. In addition some chemical data were also collected. A succession relative to the pollution tolerance of the taxa occurred downstream of the slurry outfall. Although the pollution had persisted for a number of years, there was evidence that it had become less severe and that this trend would continue in the future.

Introduction

Brookhouse Brook is a major tributary of the River Roding in south-west Essex which drains an 18.1 km² section of the eastern slopes of the Epping Forest ridge. The brook receives urban and motorway run-off, treated domestic effluent and agricultural waste along its course. Over 80% of the catchment is agricultural land, predominantly on London Clay. The headwater catchment of this stream drains a 4 km² area of deciduous woodland and mixed farmland south of Epping, Essex. There is considerable variation in discharge as the stream responds rapidly to rainfall.

Great Gregories Farm is a mixed dairy holding within the headwater catchment study area. Farm waste including slurry from about 150 cattle collects in storage tanks which overflow into a drainage ditch connecting directly with Brookhouse Brook. This situation is known to have existed for at least 10 years. Considerable sums of money have been spent to improve this system and in 1986 the drainage ditch was dammed to restrict the flow of slurry, and a parallel drainage pipe installed to carry surface water to an outfall on the stream. The drainage pipe has since become contaminated by farm waste, which also periodically enters the stream from the ditch (most recently causing a pollution event in April 1988). However Great Gregories Farm will cease its dairy operations in the summer of 1989. The catchment upstream of the outfall is largely woodland, but downstream consists of arable and grazing land. Surface water from the M25 motorway also enters the brook and a tributary brings some urban run-off from southern Epping.

Livestock slurry may have a biological oxygen demand (BOD) of 25000 mg/l (Dale and Day 1967) compared to a value of 100 to 300 mg/l for untreated domestic sewage (Miner and Willrich 1970). In a stream, microbial oxidation of organic matter depletes dissolved oxygen, while the suspended solids associated with slurry (Miner and Willrich 1970) cover stony riffles with anoxic mud. Deoxygenation and deposition of solids have a considerable combined effect on the invertebrate fauna, typically leading to the dominance of species which are normally associated with silted areas and tolerant of low oxygen levels. Benthic macro-invertebrate communities are well established as indicators of freshwater pollution (Hynes 1959; 1960). Hawkes (1979) determined community types which generally correspond to different levels of organic pollution, depending on the tolerance of individual taxa.

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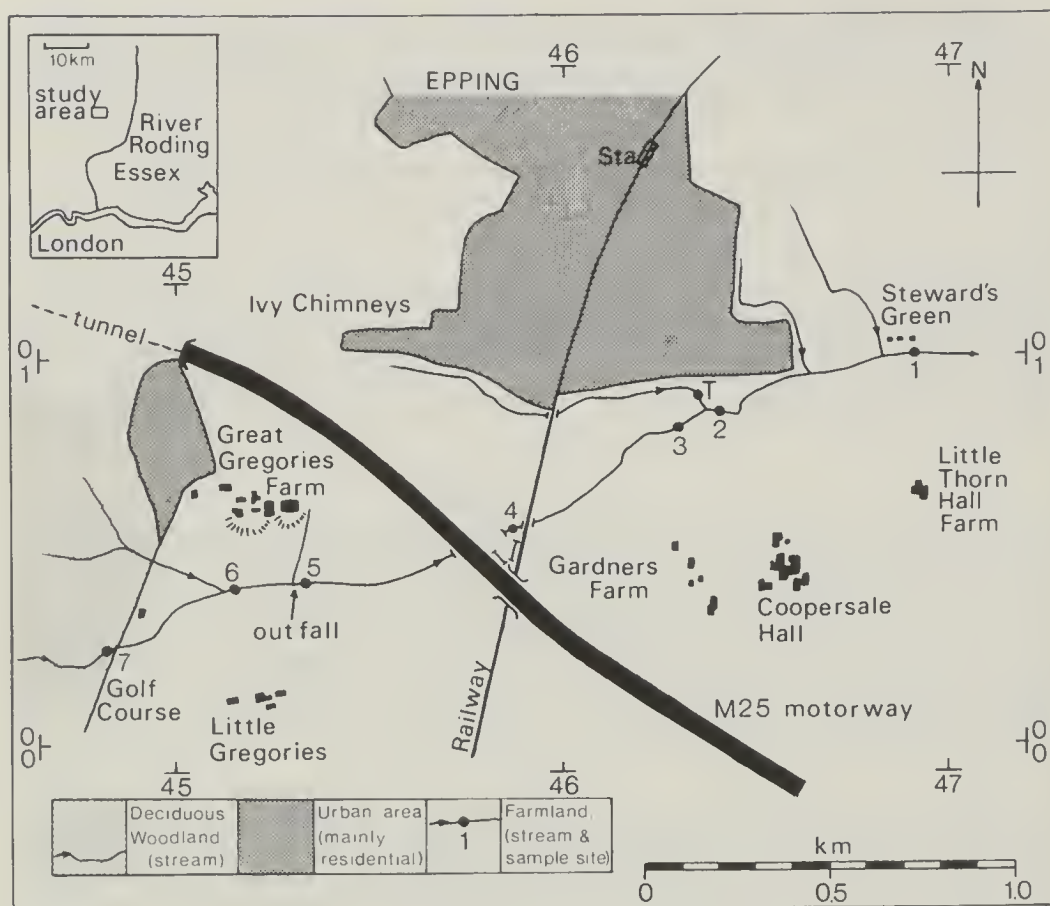


FIG. 1. Map of the study area (Brookhouse Brook headwater catchment).

Methods and Materials

In October 1985, April 1987 and October 1988, eight sample sites in the upper Brookhouse Brook catchment (sites 1 to 7: National Grid references TL 469010 to TL 447002; and site T: TL 463009) were investigated (Figure 1). Three 30-second kick samples of the macro-invertebrate benthos were taken from stable gravel riffles at each site using a net with a mesh diameter of 250µm and an opening 230mm × 225mm, adapted from Macan (1958). The samples were laboratory sorted and classified to species where possible. A hydrobiological index of water quality, the BMWP score (National Water Council 1981) was also applied to the data. In addition, field measurements of dissolved oxygen were taken and samples were also returned to the laboratory where ammonia levels (using a 'Kjeltech' 3010 analyser) and five day BOD were determined.

Results and Discussion

At sites 6 and 7 upstream of the farm outfall, dissolved oxygen was found consistently to exceed 9.0mg/l, while BOD remained below 0.5mg/l and ammonia was undetectable throughout the study. Water quality deteriorated markedly at site 5 downstream of the outfall on all sampling dates. However, in October 1985 and February 1987 the lowest levels of dissolved oxygen (<3.9mg/l), and highest BOD (>6.7mg/l) and ammonia (>13.7mg/l) readings were obtained at site 4. Such a delay between the release and microbial breakdown of organic material in a stream is typical (Mason 1981), although in October 1988 site 5 had the most extreme conditions. Motorway run-off also

enters the brook above site 4, but this is known to be of considerably higher water quality than the brook itself. There was some improvement at site 3 over the study period, and this was accentuated at site 2 by the confluence of a relatively unpolluted tributary (site T) which carries some urban run-off. Although dissolved oxygen levels at site 1 were similar to those of sites 6 and 7, BOD ($>3.9\text{mg/l}$) and ammonia ($>3.5\text{mg/l}$) remained at somewhat elevated levels throughout the study. The presence of ammonia at site 1 is significant since its toxicity is largely independent of the concentration of dissolved oxygen (Tittizer and Kothe 1979).

The BMWP scores recorded on each of the sampling dates, and selected invertebrate distributions from February 1987 are shown in Figure 2. In October 1985 the BMWP score at site 5 directly below the outfall was zero. Downstream at sites 4 and 3 the BMWP scores remained low, but increased to 26 at site 1. The BMWP scores of all sites in February 1987 were higher than those of October 1985. It is known that seasonal variation of invertebrate communities

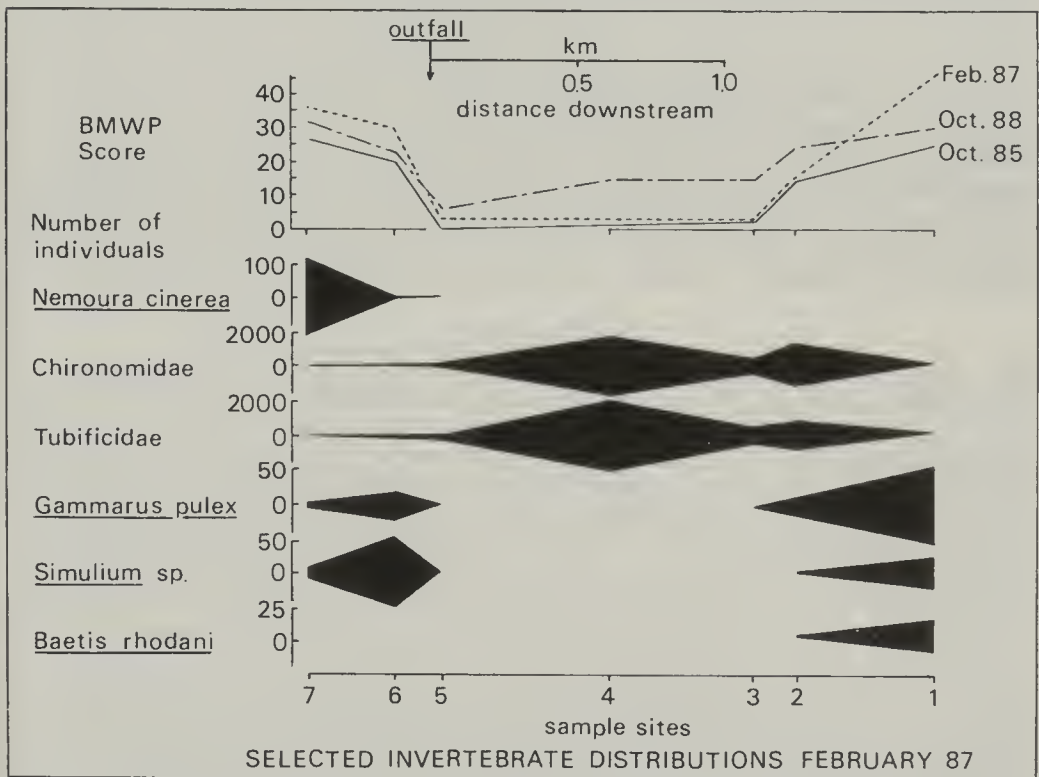


FIG. 2. BMWP scores at each site throughout the study period and selected invertebrate distributions from February 1987.

in similar streams can affect the BMWP score (Boreham 1989). The average score per taxon (ASPT) (Murphy 1978) is less affected by seasonal variation, and applied here indicates a marginal increase in water quality between October 1985 (site 4 ASPT = 1.0) and February 1987 (site 4 ASPT = 1.5). In October 1988 the BMWP score below the outfall was 6, rising to 15 at sites 4 and 3. This apparent improvement in water quality is confirmed by the ASPT (site 4 = 3.0), and also by the chemical data.

The selected invertebrate distributions from February 1987 (Figure 2) are broadly representative of those occurring throughout the study period. The stonefly *Nemoura cinerea* was confined to sites 7 and 6 above the outfall, with other pollution-sensitive taxa such as the caseless caddis-fly larva *Polycentropus* sp. However, downstream of the outfall (sites 5, 4 and 3), the Chironomidae

(mainly *Chironomus riparius*) and the Tubificidae were the only groups which occurred in October 1985 and February 1987, with the exception of the air breathing 'rat-tailed maggot' *Eristalis tenax*. In October 1988 the crustacean *Asellus aquaticus* and the leech *Erpobdella octoculata* were present for the first time at sites 4 and 3. Downstream of the tributary confluence (site 2), *Gammarus pulex*, *A. aquaticus*, *E. octoculata* and the mollusc *Potamopyrgus jenkinsi* were present throughout the study. At site 1 a consistently diverse community occurred, including the blackfly *Simulium* sp., the mayfly *Baetis rhodani*, the cased caddis-fly larva *Limnephilus lunatus* and members of the Coleoptera.

Conclusions

The benthic macro-invertebrate fauna of Brookhouse Brook shows a succession downstream of the farm outfall relative to the pollution tolerance of the taxa. It is clear that livestock slurry entering Brookhouse Brook has adversely affected the species richness of the fauna over a number of years, but that the pollution has become less severe. Macro-invertebrates are continually exposed to physico-chemical variations and so reflect long-term water quality. By contrast chemical parameters indicate water quality only at the time of sampling. Although interpretation of chemical and invertebrate data agree broadly in this study, a combination of physical factors such as variations in stream flow and effluent discharge complicated the situation. If the discharge of farm waste is reduced as a result of the cessation of dairy operations at Great Gregories Farm, it is probable that invertebrates characteristic of less eutrophic conditions will return to the affected stretches of Brookhouse Brook.

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The Dragonflies of London's East End

by D. A. MURDOCH*

Summary

This paper discusses the dragonflies Odonata from the London Borough of Tower Hamlets (the East End) and from the Surrey Docks area in the London Borough of Southwark between 1984 and 1988. By the end of 1988, five species, the blue-tailed damselfly *Ischnura elegans*, the common blue damselfly *Enallagma cyathigerum*, the common darter *Sympetrum striolatum*, the brown hawkler *Aeshna grandis* and the southern hawkler *A. cyanea*, were definitely or probably breeding, and six other species were recorded. Of the breeding species, only two, *Ischnura elegans* and *Enallagma cyathigerum*, were likely to be breeding in the canal system, but all five were established in the Surrey Docks area, where the excavation of new ponds has greatly increased the available habitat. Three species were recorded well away from water. The implications for urban nature conservation of these observations are explored.

Introduction

Very little work appears to have been published on dragonflies in urban areas, perhaps because of an assumption that the larvae would not be able to survive water pollution. However, during a three-year survey of the butterflies of the East End (Murdoch *et al.* 1987), several species of dragonfly were recorded, some of them in possible breeding habitats. In the summers of 1987 and 1988, a more thorough search was carried out to identify the dragonflies occurring in the East End, to locate potential breeding sites and to produce practical ideas for their encouragement.

Description of the Study Area and Survey Method

The study area, consisting of the inner-city Borough of Tower Hamlets lying north of the Thames and the neighbouring Surrey Docks lying south of the Thames in the Borough of Southwark, has previously been described with reference to butterflies (Murdoch *et al.* 1987). The main areas of interest for dragonflies consist of the Hertford Union and Grand Union Canals north of the Thames, and the areas of still water in the Surrey Docks. Dragonflies were also recorded round areas of semi-permanent water in the Poplar Docks (which have now been destroyed by redevelopment) and on some of the isolated pieces of derelict land in both boroughs. The River Lea is tidal in its lower reaches, but still provides a potential dispersal route for dragonflies.

The Grand Union Canal runs north from the Limehouse Basin for 4km before bending west round the southern edge of Victoria Park. The Hertford Union Canal comes off the Grand Union Canal in Bow and runs for 2km east to join the Lea Navigation Canal just above Old Ford Lock, on the northern edge of the survey area. The canal banks are usually bare (often concrete), and an extraordinary variety of rubbish finds its way into (or onto) the water, but it is clean enough for mallard *Anas platyrhynchos*, coot *Fulica atra* and moorhen *Gallinula chloropus* to breed successfully. There are frequent patches of bankside vegetation which extend into the water, and occasional areas of emergent vegetation, particularly at the eastern end of the Hertford Union Canal.

More promising habitat exists in the Surrey Docks, which contain the only long-standing areas of still water in the survey area, the Canada Dock and the Surrey Basin. The Surrey Basin has been zealously tidied up and is of no interest at all, but the western bank of the Canada Dock has been undisturbed for at least ten years; flag iris *Iris pseudacorus* is spreading along it and tufted ducks

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Aythya fuligula were able to nest successfully in 1987 and 1988.

During the redevelopment of the Docks, several ponds have been excavated to serve as leisure amenities. The most interesting is the Lavender Pond, which is managed as an urban nature reserve and educational area; it receives little shade, and has plenty of submerged and surrounding vegetation (mainly reedmace *Typha* and reed *Phragmites*). Only 250m away, a string of at least five ponds runs along the line of the old Russia Dock. One is a relatively open, shallow bowl which dries out each summer. Two are several feet deep and shaded on two sides by a dense canopy of developing trees; the other sides are lined by flag iris, but there is no emergent vegetation. Two ponds are similar to the Lavender Pond though much smaller. These ponds are only five years old and can be expected to develop further.

Weather

The summer of 1984 was hotter and sunnier than average, but the summers of 1985-88 were generally cool, or wet, or both. This might be expected to affect dragonfly numbers, and it certainly made accurate recording more difficult.

Observations

Observations were recorded on a standard form as previously described (Murdoch *et al.* 1987). To gain a measure of dispersal, records were mapped on a 1 × 1km grid based on the Ordnance Survey system. Names used are as in Hammond (1977).

AZURE DAMSELFLY *Coenagrion puella*

A singleton was recorded at the Lavender Pond on 18 June 1985.

COMMON BLUE DAMSELFLY *Enallagma cyathigerum*

The largest colony is established along the western edge of the Canada Dock, but this water is threatened by redevelopment (and so almost certain destruction of its dragonfly populations). It is scarce along the canals and on the Lavender Pond, but over 30 have been seen at one time at Old Ford Lock in the Lea Valley.

Singletons were found often on waste ground at least a mile from freshwater.

BLUE-TAILED DAMSELFLY *Ischnura elegans*

This species, which has the highest toleration of pollution of any British species, is the commonest dragonfly in the survey area. A large colony has been established for several years on the Lavender Pond Nature Reserve and numbers at least hundreds, perhaps thousands, at peak. It is also established on the Canada Dock, but it seems to be scarce along the Russia Dock ponds. Along the canals, it is present wherever bank vegetation trails in the water; at least 20 were seen along 2km of the Grand Union Canal on 7 August 1988.

Single individuals were sometimes found well away from water on patches of waste ground.

LARGE RED DAMSELFLY *Pyrrosoma nymphula*

A singleton was seen along the Limehouse Cut in 1984.

SOUTHERN HAWKER *Aeshna cyanea*

Not recorded with certainty until 1988, when at least two individuals were seen on several occasions holding territory in the Russia Dock/Lavender Pond area.

BROWN HAWKER *Aeshna grandis*

One was seen on 16 August 1984 in a part of the derelict Poplar Docks (E14) which might have well been suitable for breeding; however, the site was

redeveloped and destroyed within a year. Another was seen at Old Ford Lock (E3) on 29 July 1984.

There were several records in 1986 and 1988 from the Russia Dock/Lavender Pond area of the Surrey Docks (SE16), with at least two individuals holding territory. One was also seen at the eastern end of the Hertford Union Canal (E3) on 30 August 1988.

MIGRANT HAWKER *Aeshna mixta*

Definitely identified once only, on 30 August 1986, when one was seen flying along a derelict railway line in the Lea Valley.

Aeshna spp. (not further identified)

Unidentified hawkers were seen on three occasions, over the empty Wapping Dock (E1) on 22 September 1985, and at two sites in the Lea Valley on 16 August 1986.

EMPEROR *Anax imperator*

A single emperor was seen on the Lavender Pond in May 1984.

BROAD-BODIED CHASER *Libellula depressa*

A single individual was seen in the Poplar Docks area on 4 August 1984.

BLACK-TAILED SKIMMER *Orthetrum cancellatum*

A singleton was seen on 28 October 1984 on the Lavender Pond.

COMMON DARTER *Sympetrum striolatum*

Single individuals were recorded on four occasions at different sites; three were well away from water. A colony was discovered on the western bank of the Canada Dock in 1988, at least ten individuals being seen on 23 August.

Sympetrum sp.

A single darter seen in Tower Hamlets Cemetery on 4 August 1986 could have been a common darter or a ruddy darter *S. sanguineum*.

Discussion

This survey is unfortunately incomplete as no attempt was made to find the nymphal stages, which are, of course, aquatic. The two species of damselfly were easy to find mating, but the larger species were not definitely proved to breed – the evidence is only that they were seen regularly holding territory over ponds apparently suitable for breeding. However, a wide variety of aquatic fauna has been found in the Lavender Pond, so its water is likely to be clean enough to support dragonfly larvae as well.

The Surrey Docks are undoubtedly the most productive area for both numbers and variety of dragonflies; the Canada Dock supports common darters and two species of damselfly and the Lavender Pond/Russia Dock area two hawkers and blue-tailed damselflies. It is likely that the canals support only the two damselflies, which are known to be tolerant of water pollution (Hammond 1977). These damselflies may have been established in the East End for many years, but the ponds which support the hawkers are less than ten years old, so the hawkers must be recent colonists. The Canada Dock has been visited regularly by the author for nearly ten years, and the common darters are also recent colonists. It is very unfortunate that the western bank of the Canada, which in recent years has become valuable for birds, butterflies and dragonflies, is under threat of 'redevelopment'.

These populations are not important on a national scale – they are all common species. They are interesting because they have been able to adapt to the

environment of an inner city. The most surprising records were of common darters and the damselflies from isolated fragments of derelict land close to the City.

These highly adaptable species may soon find new breeding sites in the nature gardens set up by several schools in the East End; a pond with suitable vegetation could well support a colony of dragonflies.* Other species have colonised parts of outer London and could appear in the East End. Ruddy darters now breed in several small ponds in north-east London, and an emperor was seen ovipositing in a rubbish-clogged pond in a Brixton housing estate – and filmed by a television crew (S. J. Brooks pers. comm.)! The situation for urban dragonflies (in contrast to butterflies, Murdoch *et al.* 1987) appears to be relatively good at the moment, as long as their habitats are not destroyed.

Superficially, therefore, the East End may seem to be a totally unsuitable area for dragonflies, but several species have adapted to city life, and more may appear. No doubt there are other groups of invertebrates present in inner London which deserve study but go unrecorded.

*Information is available from the British Dragonfly Society on request.

Acknowledgments

I am grateful to Steve Brooks and Matthew Oates for reading early drafts of this paper, and to the staff of the Lavender Pond Nature Reserve who have kindly allowed me to include their records.

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TABLE 1. Dragonflies probably or definitely breeding in the East End and Surrey Docks.

Species	Number of tetrads with records	Total numbers of observations by author, 1984-88	Peak adult count on one visit
Blue-tailed damselfly	9	27	>100
Common blue damselfly	10	26	>100
Common darter	5	6	>10
Brown hawker	4	7	1
Southern hawker	2	4	1

Addendum

The western bank of the Canada Dock was redeveloped in the summer of 1989 to enhance its wildlife potential. Good numbers of common darters were seen in September.

Recent Spider Records in the London Area (London and Middlesex Counties)

by J. EDWARD MILNER*

Introduction

Since the publication of *A new list of spiders found in London* (Milner 1987a), several species have been found in London that were not previously recorded for the counties of London and Middlesex. Some of them are common species that have been overlooked while others are rarities in their own right. These new records result mostly from the investigation of sites which had not been looked at before by arachnologists, but there are also new finds from some well-worked sites such as Alexandra Park.

Some of the best sites for spiders (which are likely to be good for a whole community of organisms) are at present under threat from road and other developments in and around the capital. At present we are able to report an increasing list of species and sites in London where a reasonable diversity of species can be found, but if some of these development schemes proceed as planned, damage to the spider fauna is inevitable. As it is there are very few patches of semi-natural environment in the capital and some of the natural habitats of the London area have virtually disappeared altogether. There are only very small areas of relic ancient woodland, and the best of these at Oxleas Wood will be irreparably damaged by a Trunk Road Scheme associated with the proposed new East London River Crossing. Another proposed road scheme will destroy acid grassland and scrub on Barnes Common. Both these sites are known to have Notable Species† present, and Oxleas Woodlands is designated as an S.S.S.I.

Most of the woods and commons that do still exist were secured for public recreation historically only after considerable struggles by ordinary citizens. It is to be hoped that if anyone reads this short report in fifty years' time, they can assess whether this generation's efforts to preserve London's wild places measure up to our forebears' achievements. They may even like to see whether the spiders listed here can still be found at the sites referred to; indeed whether these sites still exist as semi-natural areas at all.

The new records or interesting finds are given below in family order, with new records for Alexandra Park, Middlesex (Milner 1987b) given at the end.

Species marked * are new County Records for London.

** are new records for Middlesex.

Unless otherwise indicated all the records are by the author.

1. DICTYNIDAE

Males and females of *Nigma walckenaeri* (*Dictyna viridissima*), a beautiful leaf-green spider, were swept from low bushes in Regent's Park in late October. This is not a new County Record but *N. walckenaeri* is only known from a few sites in London.

2. DYSDERIDAE

A subadult female *Dysdera* sp., probably *crocata*, was found in its web at the

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†Notable Species is a *Red Data Book* classification by the Nature Conservancy Council and refers to 'known from fewer than 100 10km squares in Britain (excluding Ireland)'.

base of a poplar tree in Regent's Park; this genus is not common in London although both British species have been recorded.

3. GNAPHOSIDAE

A male and a female *Zelotes latreillei* were collected from grass around an anthill at Bostall Heath in May.

4. PHILODROMIDAE

*Philodromus dispar**, which unaccountably had not previously been recorded from London, has been taken by sweeping low vegetation at Regent's Park, Bostall Heath, Holland Park, Sydenham Hill Wood (record received from the Horniman Museum), and from Finsbury Park and Golder's Green Park (both Middlesex). Males have been found at most of these sites during May but not at other times.

5. SALTICIDAE

Males and females of the Notable Species *Salticus zebraneus** have been taken from the trunks of pine trees at Bostall Heath in May, and a female *Heliophanus cupreus** was swept from low vegetation during the same field excursion.

6. AGELENIDAE

Cicurina cicur was found at Crouch End Open Space, Middlesex (between Wood Vale and Park Road). *Hahnina montana*, first recorded for London from Oxleas Wood in 1987, has since been found at Bostall Heath, and a single male *Hahnina nava* was taken in a pitfall trap at Queen's Wood (Middlesex) in December, and a female at Alexandra Park in June.

7. THERIDIIDAE

Anelosimus vittatus, first reported for London from Oxleas Wood in 1987, has since been found at Sydenham Hill Wood (Horniman Museum), Putney Heath, Regent's Park, Bostall Heath, and at Finsbury Park (Middlesex). So far, males have only been taken in May. Two subadult females of *Episinus* sp., probably *angulatus**, were found in a small patch of heather *Calluna vulgaris* on Bostall Heath. *Theridion mystaceum*, previously reported for London only from Oxleas Wood, has now been found at Bostall Heath. *Theridion pallens*, previously recorded from only one or two sites, has now been found to be widespread and in places abundant in late April and May. A female was even taken at Regent's Park in October.

8. TETRAGNATHIDAE

A male and a female *Tetragnatha pinicola***, a most attractive silvery green species, were swept from vegetation along the Parkland Walk just south of Station House on Ferme Park Road (Middlesex). *Tetragnatha montana* was taken on Barnes Common.

9. ARANEIDAE

In November a female *Cyclosa conica* (the 'bird dropping spider') was swept from low vegetation at Lcsnes Abbey Woods, just in the county of Kent, the nearest to London that this interesting species has been seen. It has not yet been found at nearby Bostall Heath in spite of careful searching.

10. LINYPHIIDAE

A male *Moebilia penicillata** was taken from the bark of an oak tree at Bostall Heath in May, and the Notable Species *Ceratinopsis stativa** (*Anacotyle*) has been found in grass at Barnes Common (a male) and Putney Heath (a female). *Troxochrus scabriculus** was found in numbers in oak/birch leaf litter at Bostall Heath in April. A single female *Silometopus elegans**, a tiny black species, was collected from grass roots at Putney Heath. *Cnephalocotes obscurus*** was found at Barnes Common, and a male and a female at Bostall Heath in July, and at Crouch End Open Space (Middlesex). *Erigonella hiemalis*, a very uncommon spider in London, was taken in a pitfall trap among leaf litter at Queen's Wood (Middlesex), and the first male *Erigone vagans* to be collected

in London was taken in early March in a pitfall trap at Camley St Nature Park near King's Cross. A male *Agyneta decora** was found at Bostall Heath in December, and a male and a female *Drapetisca socialis*** were taken in a pitfall trap at Queen's Wood (Middlesex). *Oreonetides abnormis*** is quite commonly found during the winter months at Queen's Wood.

New Records for Alexandra Park

At Alexandra Park occasional collections have been made since 1986 (Milner 1987b) and in addition to those mentioned above the following species have now been recorded from the Park (P) and the Conservation Area (CA).

These are: *Drassodes lapidosus* (Gnaphosidae) (P), *Phrurolithus festivus* (Clubionidae) (P), *Theridion varians* (CA) and *T. pallens* (CA) (Theridiidae), *Araneus diadematus* (CA, at last!), and *Araniella cucurbitina* (CA) (Araneidae), and the uncommon linyphiids *Panamomops sulcifrons* (P) and *Tapinocyba praecox* (CA), as well as the more common *Lepthyphantes flavipes*, *Linyphia peltata*, and *Microlinyphia pusilla* (all CA).

Locket *et al.* (1974) give a total of over 200 species recorded for the County of Middlesex. According to my records the list of confirmed species now known from Alexandra Park is 110. Unfortunately, as I have informed Haringey Council, the richest fauna seems to be on the grass slopes across the road and outside the present Conservation Area, which clearly should be enlarged to conserve the area concerned.

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Book Review

Deciduous Woodlands ISBN 0 00 219841 X; *Rocky Shorelands* ISBN 0 00 219842 8; *Grasslands and Scrub* ISBN 0 00 219843 6, 128pp. each; and *Heathlands* ISBN 0 00 219844 4, 112pp. Text and colour photographs by Chris Packham. Colour plates by Chris Shields. Collins Wild Habitats. 1989. £4.95 each.

Chris Packham is a successful young television presenter and photographer. His photographs are, almost without exception, superb, although many of them must be judged on their artistic merit rather than as aids to identification. These include remarkable close-ups of the spiky-wet fur of an otter and the scaly feet of a cormorant.

The first half of each book is composed of essays, based partly on the writer's field experience and that of his biologist acquaintances. The second half provides notes on the species occurring in the habitat under discussion, a list of localities to be visited, the addresses of conservation bodies and a bibliography.

The essays reflect the writer's enthusiasm, his concern for the countryside, and his personal likes and dislikes. His literary style will not be to everyone's taste. Allusions to 'rascalous Adders', a 'flabbergasted' butterfly and an 'arrogant crab' can be dismissed as

anthropomorphism, but can one have a 'faithful roosting site' or 'guilty coniferous plantations'? He is not afraid to invent words. I can accept 'seaweedlings' and 'parrotesque', but not 'foliaceous', 'pectinaceous' and 'clefted'. My gorge rises at 'rather unique', 'the smallest of the sexes', and the wrong use of 'exotic', 'decimated', 'principle', 'enormity' and 'peninsular'. A few spelling mistakes could be uncorrected typographical errors, but some occur repeatedly (e.g. 'Scomer', 'pollenia', 'Heart's Tongue Fern'). 'Wavey', 'wirey', 'waxey' and 'waxeyness' all appear on one page. He treats 'antenna' as a plural noun and 'elytra' as singular. We are presented with 'calcicol', 'strigulate' and 'chelicerie'. There are references to the gannet's 'pelage' and the natterjack's 'paratiod' glands. Trees are described as 'fauna' and the mink as an aquatic rodent. Considering that hundreds of scientific names are quoted it is remarkable that fewer than 30 have been misspelt. Bad handwriting could account for *Pyrnula pyrnula* (for the bullfinch), *Agrostic capillans* and *Lonicera periclymessum*. Brown beak-sedge appears as *Rhynchospira alba*. The fallow deer is correctly named *Dama dama* in one book and *Cervus dama* in another. The paragraphs on deer, in fact, have more than their fair share of misinformation.

A more sober style is adopted for the second half of each book, but here too the careless mistakes abound. The gazetteers mention County Trust reserves as well as N.C.C. and R.S.P.B. sites, usually giving a National Grid reference. Unfortunately, permits are needed for many of them. The lists would be more useful if all the place – and species – names had been checked. The Scots will not thank this Sassenach for inventing such localities as Abberlady, Doller Glen, Dun's Castle, Herta, Linnof Tummell, Loch Sunnart, Loch Winnock and Pittenween, or for adding 'Rannock Sprawler' and 'Angle Stripped Sallow' to their moth list.

The centre pages of each book are devoted to Chris Shields' paintings, four in *Rocky Shorelands* and five in each of the others. Each plate shows up to 23 species crowded together in a reasonably appropriate setting. The general effect is not unpleasing and we must forgive the artist for having to show smooth snake and heath grasshopper sharing their habitat with spiked speedwell and sand catchfly. Most of the mammals are well illustrated, and the birds acceptable. The plants are less well drawn, however.

In *Deciduous Woodlands* the topics discussed include photosynthesis, the territorial behaviour of the speckled wood and G. J. M. Hirons' work on woodcock. In the second half of the book 'woodland residents' are said to include icterine and melodious warblers, and *Aster linosyris*, the rare goldilocks aster, a coastal species. Epping Forest, Perivale Wood and a few other sylvan habitats in our Area are mentioned, but not Oxleas Wood or its bosky neighbours. Nagshead (or rather, 'Magshead') is listed, but not the surrounding Forest of Dean.

The *Rocky Shorelands* essays cover peregrines, otters, seals, rock-pools, seaweed zonation and cliff-nesters. Over 870 words are used to tell the inhabitants of Surrey, Derbyshire and other inland counties they must travel to visit a rocky coastline! *Helianthemum appeninum* is said to occur at only two sites, both in Devon, Berry Head and Torbay. Brean Down (misspelt) features in another book, but not as a station for this plant. Kimeridge (*sic*) is wrongly given as a locality for the bivalve *Pandora*.

When dealing with the rabbit in *Grasslands and Scrub* the author brings the Plantagenet period to a premature end in 1199. He waxes lyrical and nonsensical about orchids, explains the luminosity of glow-worms, describes his own investigations into the food preferences of shrews, and deals with the decline and reintroduction of the large blue. Information on the distribution of field crickets on p.59 is contradicted on p.85. Leicestershire C.C. is given responsibility for a Lincolnshire site, and Dorset's Fontmell Down twice appears as 'Fontwell Down'. Plants mentioned include 'Cup-leaved Cranesbill', 'Round-headed Campion' and 'Burnt Saxifrage'.

In *Heathlands* he considers the history, management and destruction of the habitat, and deals with its threatened inhabitants, including extreme rarities like the 'ladybird spider' *Eresus niger*. He confuses Galway with Galloway when writing about St Dabeoc's heath, and tells us that Dorset heath also occurs in Galloway. More Dorset heathland is accessible than his list suggests; several important sites have been omitted. Wimbledon Common is given as a locality for *Nartheicum*, not seen there since 1955. Keston Bog is not mentioned.

These books contain a lot of interesting material, and it is a pity that it was not assembled with more care. Some errors can, of course, appear *after* the proofs are checked. Chris Packham would not have added the caption 'Beech nuts' to his photograph of sallow blossom.

A Review of the Lepidoptera of the London Area for 1987 and 1988

by COLIN W. PLANT*

Abstract

A review of the more noteworthy Lepidoptera records from the London Natural History Society's recording area (based on a circle of radius twenty miles and centred upon St Paul's Cathedral), is presented for the years 1987 and 1988. In the review, nomenclature used conforms to that of Bradley and Fletcher (1986) and Goater (1986). In accordance with editorial practice, therefore, authorities are omitted from scientific names.

Introduction

The format of this review follows that of earlier years with the butterflies, micro and macro moths being dealt with under three separate headings for the convenience of readers. Butterflies are dealt with in taxonomic sequence whilst the moths are listed under the vice-county headings. Only the more noteworthy species are usually included. This will be my last biennial review of London's Lepidoptera prior to publication of a more major summary of London's larger moths which I sincerely hope will be well under way by the time that this present review is published in late 1989. With an expected publication of the work sometime in 1990 a review of records for 1989 and 1990 published in 1991 would seem largely unnecessary and it is therefore proposed to wait for the elapse of a full two seasons after publication before the biennial reviews are restarted. This does not mean, however, that records are no longer required. Far from it, in fact, since records for 1989 will certainly be included in the larger work and it is likely that records from the following year too may largely be included. Any which are received too late for inclusion will be added to the first review following publication.

Turning specifically to the review of 1987 and 1988, the main point of note concerning the capture, and hence recording, of Lepidoptera was the weather. In both years spring was cool and wet and lasted well into what used to be called summer; this affected the emergence of many insects, including the Lepidoptera. Butterflies seemed scarce in most areas and some species, notably the common blue *Polyommatus icarus*, were apparently not seen at all. Almost all regular contributors reported much depressed numbers of moths captured and fewer species recorded per trapping session, with 1988 generally worse than 1987. A brief mild spell in April 1988 brought forth such unlikely species as the scalloped hazel *Odontopera bidentata*, the bright-line brown-eye *Lacanobia oleracea*, the spectacle *Abrostola triplasia*, the iron prominent *Notodonta dromedarius* and the swallow prominent *Pheosia tremula* about two weeks earlier than usual and it was strange to see species such as these, and others, in the same trap as the early grey *Xylocampa areola*, the common quaker *Orthosia cerasi* and the hebrew character *O. gothica*! It is perhaps worth noting that in some areas at least, *O. gothica* persisted until the end of May with freshly emerged examples noted in the Essex sector in the last week of April.

This apart, there were some extremely interesting captures during the period under review. The waved black *Parascotia fuliginaria* seems to have embarked upon an expansion of its range and is reported from several localities and similar comments apply to the phoenix *Eulithis prunata*. The juniper carpet *Thera juniperata* too has appeared at a number of new localities. The appearance of the orange moth *Angerona prunaria* in the Surrey sector gives us our first

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London Area record since 1951 whilst other 'lost' species now refound during the two-year period include the July belle *Scotopteryx luridata* (last seen 1964), the scarce tissue *Rheumaptera cervinalis* (not reported since 1972), the scallop shell *R. undulata* (last reported in 1957), the white-line snout *Schranksia taenialis* (1903), the marsh oblique-barred *Hypenodes turfosalis* (1958) and the fallow clearwing *Synanthedon flaviventris* (refound in its former locality where it has not been noted since 1954). Knowledge of the forthcoming publication on London's moths has instilled in some contributors a welcome awareness of the need to examine critically certain species and this has reaped rewards. The distribution map for the dark dagger *Acronicta tridens* is improving regularly, for example, and many observers are being pleasantly surprised at what *really* occurs in their gardens! Another example of a moth reported more frequently as a result of extra care being taken is the northern winter moth *Operophtera fagata*. Though this is not usually a species in need of dissection many casually dismiss all 'winter' moths at the kitchen window as the certainly more common *O. brumata* – often without catching the insect.

Microlepidoptera are a rather more specialist group than their larger brethren, though the division is entirely artificial and, to my mind, rather pointless. Many smaller moths can be 'done' just as easily as the larger noctuids and geometers, some being particularly distinctive. The pyralids ought to provide a useful starting point for would-be 'micro men' (and ladies) and from here one can progress to the tortricoids and hence to the more interesting groups such as Gracillariidae, Nepticulidae and Gelechiidae. I welcome extra contributions to the records no matter how insignificant they may seem.

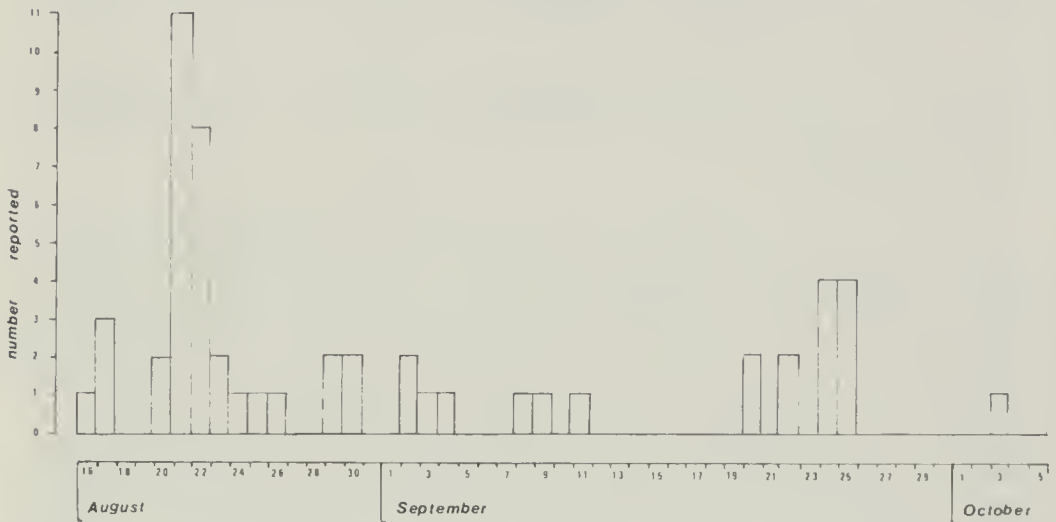


FIG. 1. Analysis by date of reported records of the vestal moth *Rhodometra sacraria* in the London Area in 1987. The total number reported is 54. See text for discussion.

As far as immigrants are concerned the major event of the period was the 1987 influx of vestals *Rhodometra sacraria*. Evidence suggests (Figure 1) that there were two separate influxes – in August and then in late September. The same year also produced a slender burnished brass *Diachrysia orichalcea* in South Croydon during August, an angle-striped fallow *Enargia paleacea* at Bexley in July, a humming-bird hawk *Macroglossum stellatarum* in Lambeth and a clouded yellow *Colias croceus* on the Isle of Dogs in October. Painted ladies *Cynthia cardui* were scarce in 1987 with the only record being of two examples at Beddington in August. Twenty-eight red admirals *Vanessa atalanta* were noted at Beddington in August 1987 during which month there are also records from Scrubs Wood and Potters Bar. There were no spring records for

either species in 1987 but in the following year there were examples of red admirals at Hampstead and Wanstead in May and of painted ladies at Wimbledon Common in April and Osterley Park and Wanstead in May. There were further painted ladies at Richmond Park in July and at East Sheen, Woodmansterne and Shobden in August whilst red admirals were seen at Woodmansterne in July, Harrow in August, Woodmansterne again in September and Purley in October. 1988 also saw examples of the swallowtail butterfly *Papilio machaon* at Epping Forest in June, a bordered straw *Heliothis peltigera* at Cheam in September, a scarce bordered straw *H. armigera* at Wimbledon in October, a delicate *Mythimna vitellina* at Mugswell and a cosmopolitan *M. loreyi* at Orpington, both in the same month and a scattering of vestals in August and September.

Once again a few comments on works concerning the Lepidoptera published since the appearance of the last review are appropriate. Two books on butterflies affecting our recording area appeared at more or less the same time at the end of 1987. Brian Sawford's *Butterflies of Hertfordshire* covers a large part of our 'patch' at the top of the map and was reviewed by me in *The London Naturalist* 67: 146. It is recommended reading. Modesty prevents me from commenting upon *The Butterflies of the London Area* which was reviewed by Eric Philp on page 24 of the same journal.

Corrections to review of 1985/86

The following important corrections should be made to my earlier review in *The London Naturalist* 66 (1987):

- p. 140 Under the heading 'V.C. 16, West Kent' on line six of this section, for '*Celypha roseana*' read '*Celypha rosaceana*'.
- p. 141 *Catoptria pinella* is, of course, not a pine-feeding species. The larvae feed on *Eriophorum*, *Deschampsia* and other grasses. Its specific epithet appears to derive from the fact that the adult moth frequently rests in pines.
- p. 149 In the third paragraph (South Croydon), line 7, Bernard Skinner's rare ab. of the heart and dart moth is correctly spelt '*csutaki*' not '*sutaki*'.

BUTTERFLIES

The end of 1987 saw the publication of *The Butterflies of the London Area* (Plant 1987a), which summarised all the available data on these insects in our area. However, additional tetrad records are still needed as indeed are interesting observations on species already recorded. Few records of note have been received during the period under review and only the principal highlights, together with all immigrants reported, are included here in taxonomic order.

A single swallowtail *Papilio machaon* was seen by Mr P. Tout at 14.30 hours on 14 June 1988 at the Epping Forest Conservation Centre near High Beach. The insect was apparently flying fast and may have been a migrating individual. It was reportedly a 'fresh' specimen. A second example, this time reported as a 'tattered' example, was seen elsewhere in the Forest at Connaught Water at midday by Mr T. Bennett.

From Potters Bar Mr J. King reports the sighting of a wood white *Leptidea sinapis* on 2 May 1987. It was fluttering in true wood white fashion around the bushes that border some scrubby woodland next to a meadow and was eventually coaxed out onto his finger where he was able to get a good look at it. Of course, as is usual on such occasions, the camera was at home! There is no reason whatsoever to doubt this record and Mr King is familiar with the butterfly on the Continent. This represents the first confirmed sighting of this species in the London area since 1976 and adds strength to the provisional record of an individual at Bricketwood Common, Hertfordshire in 1983. It is rather satisfying that the butterfly should choose to appear in the very part of

the London Area where I predicted its return was most likely (see *The Butterflies of the London Area*, page 61).

A single clouded yellow *Colias croceus* was seen on the Isle of Dogs at the Mudchute farm during the first week of October 1987 by Mr K. Harris.

A single larva of the white-letter hairstreak *Strymonidia w-album* was noted on English elm *Ulmus procera* at Bookham Common on 21 June 1988 by Mr G. A. Collins. This is a favoured foodplant in the London Area (see *The Butterflies of the London Area* pages 79-81).

At Banstead Down on 20 June 1987 Mr S. Gale counted 113 small blues *Cupido minimus*, a particularly pleasing report as there are still only eighteen known breeding colonies of this species in the London Area. The common blue *Polyommatus icarus* on the other hand seems to have had a particularly dire two years with many regular correspondents stating that they had not seen any at all – anywhere! Records for 1989 are particularly requested for our area.

From the garden of Buckingham Palace the gardeners report that the holly blue *Celastrina argiolus* was sighted more frequently than in other years and this was confirmed by Mr J. D. Bradley who observed this attractive butterfly on his visits to examine the moth trap in the garden. At Pinner, Mr W. Minnion watched a female laying eggs on ivy buds on 30 and 31 July and again on 5 August 1988.

Four purple emperors were seen on Ashted Common, Surrey by Mr S. Gale on 25 July 1987 and on 11 July by Mr G. Geen.

Several larvae of the small tortoiseshell *Aglais urticae* were collected at Custom House during 1988 by Mr P. Farwell and taken by his wife Carol to Uphall Primary School at Ilford for the children to rear through. To their surprise, amongst the many normal butterflies which eventually emerged was a single example of an extreme aberrant form with the hind wings more or less entirely black whilst the dark markings of the forewings were greatly enlarged and diffuse. As far as I am able to ascertain this does not seem to conform to any named form. The specimen was exhibited at the annual exhibition of the British Entomological and Natural History Society during 1988. A late example of the small tortoiseshell was noted on 27 December 1988 at Park Downs in Surrey by Mr P. Strangeman.

A painted lady *Cynthia cardui* was seen by Miss E. Oxford on 24 July 1988, feeding on thistle flowers at Palewell Fields near to Richmond Park; it, or another, was still present the next day. Another was seen by her on *Buddleia* at East Sheen on 7 August in the company of a single red admiral *Vanessa atalanta*. There were 28 red admirals at Beddington Sewage Farm on 2 August 1987, where the observer, Mr D. A. Coleman, noted two painted ladies on 22nd of that month. Mr P. Strangeman noted single painted ladies at Woodmansterne on 3 and 5 August 1988 and single red admirals there on 31 July and on 24 and 25 September 1988. Mrs P. Dawe saw a painted lady at Shobden Valley, Surrey on 25 August 1988 and red admirals at Purley on 19 and 21 October in the same year. Other painted lady records received are from Osterley Park, Middlesex, where one was seen by E. and G. Daniel on 8 May 1988; Wimbledon Common on 25 April, 3 and 6 May 1988 by Mr T. Drakeford; Wanstead on 14 May 1988 by Mr N. Mallett and an undated example at Harrow by Mr M. Thain in 1988. Red admirals were also noted from Scrubs Wood, Middlesex on 28 August 1987 by Mr R. Burley, Hampstead on 14 May 1988 by Mr R. A. Softly, Wanstead on 14 May 1988 by Mr N. Mallett, Potters Bar on 1 August 1987 by Mr J. King and Harrow on 29th August 1988 by Mr M. Thain.

At Beddington Sewage Farm a single dark green fritillary *Argynnis aglaja* was reliably reported on 19 July 1987 by Mr D. A. Coleman.

Four speckled woods *Pararge aegeria* were seen in the Tower Hamlets

Cemetery by Mr T. Lyle in 1988 – the highest count here to date. This species was also noted at Clerkenwell Green in 1988 where a small number of larvae were 'put down' by Mr N. Mallett during 1986 and at Buckingham Palace garden on several occasions in September 1988 from where the insect was first recorded in October 1972. The species is also reported as 'increasing' at Fryent Country Park, according to Mr L. R. Williams.

MICROLEPIDOPTERA

Inner London (V.C. 21 Middlesex)

At Fulham, Mr J. Burge has again operated his Robinson trap in the vicinity of the King's Road on a regular basis throughout the two-year period under review. New micros to his list in 1987 included *Agonopteryx nervosa* and *Pyrallis farinalis* on 25 June, *Dioctria abietella* on 27 June (possibly as an immigrant?), *Blastobasis decolorella* on 29 June, *Ancylis achatana* on 30 June, a female *Ephestia parasitella* on 4 July and *Oncocera formosa* on 12 July. During 1988, the pyralids *Ephestia kuehniella*, *Scoparia pyralella*, a freshly emerged *Assara terebrella* and *Numonia advenella*, along with the tortricoids *Aethes sneathmaniana* and *Eudemis profundana*, were added to his list.

At Holloway, on the edge of our artificially created Inner London zone, Mr N. Bowman found nine different species of micros inside light fittings in a building and sent these to me for identification. Apart from a *Coleophora* which had lost its abdomen all were still in recognisable condition. The identifications are a single *Chrysoteuchia culmella* and two *Plodia interpunctella* representing the Pyralidae, *Plutella xylostella*, *Monopis laevigella*, five *Hoffmannophila pseudospretella*, three *Argyrotaenia pulchellana*, *Cochylis implicitana* and, perhaps the most interesting, a single male *Mompha nodicolella*.

The light trap in the garden of Buckingham Palace has now been operated for twenty-nine consecutive years and Mr J. D. Bradley has kindly supplied me with a list of the notable Lepidoptera recorded therein. Although mercury-vapour traps are not terribly efficient at catching micros generally, two species were new to the Palace garden in 1988. One of these *Niditinea fuscella* (= *fuscipunctella* Haw.) on 7 June is a widely distributed species in the London Area and its presence is surprising only in that it has not been noted long ago. On the other hand the other new species *Argyrotaenia ljungiana* (= *pulchellana* Haw.), taken on 18 August, generally frequents heathland and moorland biotopes and is more likely a city insurgent. During the same year examples were taken at Grays in South Essex by the Rev. David Agassiz whilst there are recent records from King's Cross and Fulham in the Inner London area during 1985 (Plant, 1987*b*), and at East Ham and Stratford in South Essex.

Inner London (V.C. 17 Surrey)

No Microlepidoptera records have been received from this area for 1987 or 1988.

V.C. 16 West Kent

Mr I. Ferguson's 1987 captures at light in his Orpington garden deserve some mention. Particularly noteworthy was *Caloptilia azaleella* taken on 27 May and again on 12 June, though it is almost certain that the origin of these moths was not the *Rhododendron* bushes in the garden! An imported *Azalea* is a far more likely explanation. A large number of the juniper-feeding gelechiid *Dichomeris marginaria* was noted during the year, with adults noted on several dates; no doubt here, as in other areas, the larvae are dependant upon garden varieties of juniper as a foodplant. The oecophorid *Agonopteryx ciliella* was taken on 7 April after hibernation. Three pyralids of note were *Evergestis pallidata*, a local species in the London Area, *Ostrinia nubilalis* which continues its spread and

must now surely be distributed throughout our area of operations and *Ebulea crocealis*, a scarce moth in this region, whose larvae feed upon common fleabane *Pulicaria dysenterica* and ploughman's spikenard *Inula conyza*.

V.C. 17 Surrey

Amongst many common species captured at the southern extremity of our area in Buckland during 1987 was the coltsfoot-feeding plume-moth *Platyptilia gonodactyla*, noted on 30 May by Mr I. Dodd. This is surely an under-recorded insect which probably abounds wherever coltsfoot *Tussilago farfara* grows.

At Ashted, a total of 29 pyralids was attracted to the light trap of Mr G. Geen during 1988. These included *Catoptria falsella* on 23 August as well as more frequently encountered species.

At Wimbledon, Sir John Dacie took *Evergestis extimalis* on 16 August 1988, a pyralid seldom encountered in his part of the London Area, though it is quite a prevalent insect on the Essex side of the Thames in London. Earlier in the same year, a single *Dioryctria abietella* was captured on 22 June, giving rise to speculation that it may have represented an immigrant example.

Amongst several micros captured by Mr R. F. McCormick at North Cheam during 1988 were *Stenoptilia pterodactyla* on 7 June and *Platyptilia ochrodactyla* on 21 July.

V.C. 18 South Essex

The 'micro of the year, 1988' was undoubtedly taken at Grays Chalk Quarry S.S.S.I., an Essex Naturalists' Trust Nature Reserve. On 2 July 1988, the Rev. D. Agassiz and Mr B. Goater were collecting here with the Danish Lepidopterist Ole Karsholt. Dr Karsholt exclaimed that he had captured an example of *Cydia medicaginis* (Kuznetsov) which he had released as it was a moth he had collected before. However, as Messrs Agassiz and Goater were quick to point out, *C. medicaginis* was not a known British species and that what Dr Karsholt had captured was probably *Collicularia microgrammana*. To cut short a fairly lengthy saga, a number of specimens were promptly collected and this led to the separation of *C. medicaginis* from *microgrammana* and to its addition to the British list from Grays in 1988. *C. medicaginis* feeds as a larva on lucerne whilst *microgrammana* is an *Ononis* feeder. Both moths fly at the same time of year and both are present at Grays. Superficially they are remarkably similar and examination of the valves of the male genitalia (which can be performed without recourse to dissection by carefully removing the terminal sternites of the abdomen) is considered desirable. The Rev. Agassiz later discovered the new species in his collection from Grays on 5 July 1983 and from Southampton on 19 June 1970. Also at Grays, the Rev. Agassiz noted *Monochroa hornigi* on 6 July 1987, *Argyrotaenia ljugiana* (= *pulchellana* Haw.), quite commonly during August in both 1987 and 1988 and, during the latter year, he took an example of *Gelechia senticetella* Stmgr. on 6 August. A late record of interest from Grays is that of *Brachmia inornatella* on 15 July 1986.

Another late record from Grays is that of the discovery of two cases of the psychid moth *Dahlica triquetrella* by myself in May 1986. The only previous record for the entire county of Essex appears to be that made by the Rev. C. R. N. Burrows at Mucking in 1919 – outside the London Area (Plant, 1988, *Ent. Rec.* 100: 19-20).

Mr C. Griffin recorded *Aphomia sociella* and *Eurhypara hortulata* at the light of a hand-held torch in his garden at Hainault during 1987.

Dr P. H. Sterling paid a visit to St Mary Magdalene Churchyard Nature Reserve, East Ham during 1987 and, under my very nose, added a new species to the reserve list in the form of *Cosmopterix zieglereella*!

At Running Water Wood, Aveley, Mr R. W. J. Uffen succeeded in breeding out the coleophorid *Metriotes lutarea* from *Stellaria holostea*. It had long been suspected that this was the foodplant but this appears to be the first proof available for British examples.

V.C. 19 North Essex

No records have been received for the period under review.

V.C. 20 Hertfordshire

The only Microlepidoptera records received from that part of the Hertfordshire vice-county affecting the London Area are those obtained on the L.H.N.S. field trip to Broxbourne Wood on 31 October 1987 led by Lt. Col. A. M. Emmet, who has supplemented the list with his own records from a reconnaissance trip there six days earlier. A combined total of 69 species is noted. Most noteworthy amongst these were *Stigmella svenssoni* (mines on oak *Quercus*) and *Tischeria angusticolella* (mines on *Rosa*), both of which appear to be new to Hertfordshire as a whole.

V.C. 21 Middlesex

A number of micro moths were collected in the Wraysbury area of Middlesex by Mr S. Church during 1987 and passed by him to Dr P. H. Sterling for identification. In June there was *Agonopteryx ocellana*, *Orthotaelia sparganella*, *Aethes hartmanniana* and *Ephestia parasitella*. The next month he recorded *Blastobasis decolorella* and *Mompha epilobiella* and then in September *Pancalia leuwenhoekella*.

From Hampstead Heath, Mr R. A. Softly has compiled a summary of his Microlepidoptera records obtained for the period 1980 to 1988 and has arrived at the impressive total of 268 species. His list contains many interesting species, several of which were mentioned in earlier reviews. In particular for the period 1987/88 he notes that, as in earlier years, adults of *Bucculatrix thoracella* at light indicate that a second brood is the norm, in spite of the statement in Heath and Emmet (1985) that it only has second generation larvae in hot summers in the south-east. Larvae were seen by Mr Softly 'in profusion' on lime trees here on 4 October 1987.

From nearby Highgate Wood, Mr M. Hammerson noted the brown long-horn *Nematopogon swammerdamella* at light in 1987, whilst from his own garden nearby six micros were identified by him: *Eriocrania subpurpurella*, *Diurnea fagella*, *Caloptilia stigmatella*, *Ypsolopha parenthesesella*, *Epinotia solandriana* and *Cydia pomonella* – all fairly prevalent species.

At Pinner, six new pyraloids were added to the garden list of Mr W. E. Minnion during 1987. The plume moth *Platyptilia gonodactyla* has already been mentioned under the Surrey heading; the remaining five additions are all common members of the family Pyralidae and are *Crambus perlellus*, *Schoenobius forficellus*, *Cataclysta lemnata*, *Pyrausta purpuralis* and *Myelois cribrella*.

An L.N.H.S. field trip to Stanmore Common and Bentley Priory, led by Mr R. W. J. Uffen on 8 October 1988 produced a combined list of 63 species of micro including no fewer than five new records for Middlesex. These were *Ectoedemia heringi* (Stanmore Common) and *Stigmella splendidissimella* (both sites), whose tenanted mines were located on *Rubus*; *Stigmella sorbi* of which a vacated mine was found on rowan *Sorbus aucuparia* on Stanmore Common; *Parornix carpinella* of which vacated mines and evidence of larval feeding were discovered on *Carpinus* at Bentley Priory and *Coleophora milvipennis* whose cases were present at both sites on birch *Betula* and hawthorn *Crataegus*. Two additional species will prove to be new county records if their identification is

confirmed in 1989 by breeding the adults from collected mines. These are *Phyllonorycter anderidae* and *Stigmella carpinella*.

V.C. 24 Buckinghamshire

No records of Microlepidoptera have been received from this part of our survey area for the two years currently under review.

MACROLEPIDOPTERA

Inner London (V.C. 21 Middlesex)

Mr N. Mallett recorded a number of species in the Clerkenwell Green area of Inner London during 1988, mostly attracted to the lights of the new open-style telephone 'boxes'. Geometers noted were the winter moth *Operophtera brunnata*, brimstone *Opisthograptis luteolata*, the scarce umber *Erannis auran-tiaria*, melanic forms of the willow beauty *Peribatodes rhomboidaria*, both the typical and melanic forms of the peppered moth *Biston betularia* and the swallowtail *Ourapteryx sambucaria*, whilst the noctuids were the garden dart *Euxoa nigricans*, heart and dart *Agrotis exclamationis*, yellow underwing *Noctua pronuba*, lesser yellow underwing *N. comes*, broad-bordered yellow underwing *N. fimbriata*, grey or dark dagger *Acronicta psi* or *A. tridens*, the brick *Agrochola circellaris* and the dark chestnut *Conistra ligula*. Amongst the remaining families of larger moths were the lackey *Malacosoma neustria*, the garden tiger *Arctia caja*, the ruby tiger *Phragmatobia fuliginosa* and the leopard *Zeuzera pyrina*. A single larva of a poplar hawk *Laothoe populi* was noted by him on the pavement beneath a beech *Fagus* tree at Clerkenwell on 15 August 1988, though there is nothing to suggest that the larva originated from this tree. Elsewhere in the same area he noted the vapourer *Orgyia antiqua* and on 13 April 1988 he assembled a single male emperor *Saturnia pavonia* to a virgin female on the roof of his office at Clerkenwell Square.

An interesting discovery in central London was that by Mr S. Church of a large number of larvae of the vapourer *Orgyia antiqua* feeding on the London plane trees *Platanus* $\times$ *hybrida* at Leicester Square in 1987. Though the vapourer is fairly well reported from central London, this record represents the largest colony so far.

From the Fulham area Mr J. Burge's trap again operated during the two-year period under review and produced a number of new species, expanding his already most impressive list for this Inner London site. Particularly noteworthy for this area were the plain golden-Y *Autographa jota* on 8 July and the yellow-barred brindle *Acasis viretata* on 10 May, both during 1988 and both new species for the Inner London rectangle. Single examples of the vestal *Rhodometra sacraria* were captured on 29 August and 21 September 1987.

Another species new to Inner London was added from Camley Street Nature Park in the King's Cross area, where Mr R. A. Softly recorded an example of the phoenix *Eulithis prunata* on 15 July 1987. This is a moth which seems to have become more common in the last two years though nearly all the current records are from south of the Thames in Surrey and Kent. In contrast, the dark spinach *Pelurga comitata* is well recorded from the more urban areas; an example was captured at Wapping by Mr N. Bowman during August 1988.

From the north-eastern corner of our artificial Inner London rectangle, Mr J. Turner has sent me a list of 109 species of macros recorded in his garden trap in Culford Road, N1, from 1980 to 1988. Many species are of interest in view of the densely urban nature of the area itself, though it is surprising just how many moths penetrate our capital city generally. Of particular note is a great brocade *Eurois occulta* on 30 July 1982. This is an immigrant species in the London Area and this is only the twenty-third example to be recorded here. Two other examples from the same year have already been reported (Plant,

1986). Among the other notables on the list is an example of the pale shining brown *Polia bombycina*, a rare moth in the London Area with only five records since 1980; this record, of a single specimen captured on 10 June 1980, represents the first for Middlesex since 1965. Also noted are the hedge rustic *Tholera cespitis* — a very local moth in London — and the first Inner London record of the crescent *Celaena leucostigma* — a moth of aquatic biotopes which is not recorded more than a few kilometres away from the Thames.

The moth trap at Buckingham Palace garden was again operated by Mr J. D. Bradley in 1988 — for the twenty-ninth consecutive season. Here, the brown tail *Euproctis chrysorrhoea* was thankfully absent for the first time in a number of years, reflecting the gradual diminishment of the plague of about ten years ago. In contrast to this, the old lady moth *Mormo maura* was unusually common with three to five or more specimens nightly on occasions during July. The peppered moth *Biston betularia* and the scalloped hazel *Odontopera bidentata* were also taken here, in various melanistic forms grading from near typical light-coloured to black in both species.

Finally, for the Middlesex portion of Inner London, Mr C. Penney reports an old lady *Mormo maura* at a public house in Blackfriars within 200 yards of St Paul's Cathedral — the very centre of our recording area — during the first week of August 1988.

Inner London (V.C. 17 Surrey)

Once again, very few records are received from this part of our area. Certainly it represents some of the most inhospitable habitat available to moths in London, but on the other side of the coin it follows that almost everything captured is likely to be of interest! It is an area from which I would particularly welcome contributions and whilst not the sort of area which one would feel inclined to voluntarily visit after dark, there are no doubt a number of office or other premises with rear balconies or flat roofs where a moth trap could be left running overnight. The poorly recorded area stretches beyond the strictly defined Inner London region extending east to the Isle of Dogs and Greenwich in a strip between one and two kilometres wide on the south side of the River Thames. The only record of note for the 1987/88 period comes from the Archbishop's Park, Lambeth where, on 24 July 1987, Mr J. Colmans was fortunate in finding a hummingbird hawk-moth *Macroglossum stellatarum* feeding on *Buddleia* blooms.

Also from this southern portion of Inner London, Mr J. Dews sends a late record of a hummingbird hawk-moth at *Nicotiana* flowers at Peckham on 2 October 1986.

V.C. 16 West Kent

Mr I. L. Brydon has sent me his most useful list of moths recorded at Bexley from 1975 to 1988. Most interesting were the small seraphim *Pterapherapteryx sexalata* in 1980 (apparently a rarity in our area with records from no more than five tetrads), the dark umber *Philereme transversata* in 1981, a decidedly southern species in our recording area and, most recently, the July belle *Scotopteryx luridata* on 13 August 1987 — only our third post-1979 tetrad record. The larval foodplant is gorse *Ulex* and Mr Brydon informs me that this is abundant on Dartford Heath and extends along the A2 road into local wasteland areas. He considers the possibility of a small colony at nearby Bexley Park. A vestal *Rhodometra sacra* visited a tungsten light in his house on 30 August 1987. In common with most people, Mr Brydon had disappointingly poor captures during 1988, but did manage two immigrant species in the form of the vestal on 30 August, with further singles coming on 10 and 11 September and a bordered straw *Heliothis peltigera*, also on 10 September.

From Orpington Mr I. Ferguson has sent me a list of 183 maeros taken at light in 1987, of which at least eight are worthy of mention here. The least earpet *Idaea vulpinaria* was taken on several dates indicating that it is now firmly established in that area; a male vestal was noted on 16 August and the barred red *Hyles fasciaria* was seen on the same date. The northern winter moth *Opheroptera fagata* is apparently far less common than the winter moth *O. brumata* in the London Area; four were noted on 30 October and another the following evening. A single scarce prominent *Odontosia carmelita* turned up on 27 April, a welcome addition to his list though not altogether unexpected in the southern part of the London Area. The cream-spot tiger *Arctia villica*, on the other hand, is not a moth which is common in any part of the London Area today, though it used to be frequently taken on the marshes of the Thames in Kent and Essex. One came to the Orpington light on 15 June. The tawny shears *Hadena perplexa* put in an appearance on 21 June and then on 19 August the dusky sallow *Eremobia ochroleuca* was captured. The following year, 1988, was particularly noted for the capture by Mr Ferguson of a juniper carpet *Thera juniperata* on 21 October.

Elsewhere in Orpington the immigrant cosmopolitan *Mythimna loreyi* was taken on 21 September 1988 by Mr P. Sokoloff. This is a particularly valuable record since it represents the first ever record for the London Area. A previously published record from Reigate on 29 August 1983 (*Proc. Trans. B.E.N.H.S.* 17: 23) was in reality made at Leigh, just outside our area, but was cited as Reigate in the literature since this is the nearest large town (Plant, 1986). Three weeks later Mr Sokoloff found a humming-bird hawk-moth *Macroglossum stellatarum* inside his garden shed on 19 November, apparently attempting to hibernate! The previous year the vestal was noted on 20 and 26 August. Elsewhere in Orpington Mr R. G. Chatelain captured vestals on 2, 17 and 20 August, and then on 3 October – all in 1987.

The goat moth *Cossus cossus* was located in Oxleas Wood during 1988 by Mr A. A. Allen who came across a fallen oak affected by the larvae during July (*Hoverfly Newsletter* 8, Oct. 1988).

The end of 1988 saw the twentieth consecutive year of trapping at Dartford by Mr B. K. West. In 1987 eleven specimens of the satin lutestring *Tetheella fluctuosa* were attracted from 10 to 19 July indicating a thriving colony somewhere close by. The moth was last mentioned for this local area in the Woolwich Surveys (1909) and this record raises the number of London Area localities for the species to five. The dotted rustic *Rhyacia simulans* was noted on 15 August (1) and 17 September (2) and the reddish light arches *Apamea sublustris* on 14 July. An exceptionally fine male angle-striped sallow *Enargia paleacea* was noted on 15 July, the first for the local area this century and only the sixth for the London Area, whilst the more common pearly underwing *Peridromia saucia* was noted on 10 September and the dark sword-grass *Agrotis ipsilon* on ten dates from 16 July to 18 October. The vestal *Rhodometra sacraria* occurred on 21 August (3), 22 August (1) and 23 August (1) then again on 17 September (2 females) and 20 September (1 male), suggesting two separate influxes. Returning to resident species of note, the juniper carpet was recorded on 26 October, not having been seen locally since 1904 when one was at Wilmington. This species was also taken at Orpington on 21 October 1988 and at South Croydon, Surrey on 18 October 1987 and has also appeared elsewhere, outside our study area, where it has been seemingly absent for many years. There is now virtually no wild juniper remaining in our portion of West Kent and it seems probable that the moth has taken to imported garden cultivars. The white-line snout *Schrankia taenialis* is a decidedly local insect of southern Britain and was last seen in the Dartford area at Bexley Park Wood in 1894. Mr West took an example in his garden, which adjoins Joydens Wood, on 13 July 1987 – our only recent record. Two females of the scallop shell

Rheumaptera undulata were captured on 14 August, the first locally this century and our only record since 1957 for the whole of the London Area. Other interesting species in 1987 were the waved black *Parascotia fuliginaria*, now firmly established in the West Kent portion of London, two third-brood specimens of the engrailed *Ectropis bistortata* on 2 October and unusually large numbers of the second brood of the light emerald *Campaea margaritata* with 14 on 4 September and 12 on 13 September, then a further 10 on 21 September. The privet hawk has become something of a rarity here in recent years; an example was taken at Dartford on 13 July. Finally, for 1987, a seraphim *Lobophera halterata* was taken on the exceptionally late date of 21 July.

In 1988, unexpected attendants at the light were the early tooth-striped *Trichopteryx carpinata* on 2 and 13 May (regarded as extremely rare or possibly extinct in the north-west corner of Kent) and the ash pug *Eupithecia fraxinata* on 24 June, apparently rare over the whole of the London Area. The second twin-spotted wainscot *Archanara geminipuncta* ever here came on 8 August and the first ever brindled green *Dryobotodes eremita* on 4 October. This is a moth of woodlands which shows signs of increasing its range in the London Area. The scallop shell is certainly resident in adjacent Joydens Wood as is the satin lutestring *Tetheella fluctuosa* and an example of the former presented itself at Mr West's garden light on 17 July with several of the latter coming from 20 July to 9 August. The waved black *Parascotia fuliginaria* was in good number with ten taken from 6 July to 4 August. Two examples of the immigrant small mottled willow *Spodoptera exigua* were taken here — one each on 5 September and 9 October. Both were female but eggs from the second example failed to hatch. The scarce prominent *Odontesia carmelita* put in an appearance on 30 April with a clouded-bordered brindle *Apamea crenata* on 8 June and finally a poplar kitten *Furcula bifida* on 21 June. Figures supplied by Mr West for the three forms of the peppered moth *Biston betularia* from his garden in 1988 are as follows: typical form 20%, *insularia* 23% and *carbonaria* 57% from a total sample of 214 specimens. To complete his round up of the year, Mr West has kindly listed four species which were formerly regular in his part of Kent but which have not been seen for some years. These are the large thorn *Ennomos autumnaria* (last seen 1972), the white-spotted pinion *Cosmia diffinis* (1971), the dusky-lemon sallow *Xanthia gilvago* (1972) and the blackneck *Lygephila pastinum* (1979). The white-spotted pinion may well now be extinct in the London Area if our records are to be believed. The pale shining brown *Polia bombycina* used to be seen at the Dartford trap in small numbers most years, but this too has vanished, not having been recorded since 1976 here and a similar decline has been noted by Mr B. Skinner at South Croydon.

From the vicinity of Petts Wood near Orpington, Mr D. O'Keeffe has most kindly sent me his list of 338 Macrolepidoptera recorded between October 1985 and September 1988 and, as would be expected on such a lengthy list, there are a number of worthy species. These include the oak eggar *Lasiocampa quercus* which seems to have undergone a drastic decline in our area in recent years. The orange underwing *Archiearis parthenias* is seldom reported largely because of its habit of flying high in the tree tops where many entomologists do not seem to look. Another dayflier is the speckled yellow *Pseudopanthera macularia* of which there seems to be a colony in Petts Wood. This is such an obvious insect that its absence from the record cards for much of the London Area must surely indicate its rare status in the area itself? The satin wave *Idaea subsericeata* is another evidently uncommon species on the Orpington list as is the annulet *Gnophos obscuratus*, whilst the spruce carpet *Thera britannica* is probably under-recorded. Other notable geometers include the autumnal moth *Epirrita autumnata*, the netted pug *Eupithecia venosata*, the ochreous pug *E. indigata*, the golden-rod pug *E. virgaureata* (our only recent record) and the dingy shell *Euchoeca nebulata* with two vestals *Rhodometra sacraria* on 21 August 1987. Amongst the noctuids are the dotted rustic *Rhyacia simulans*, the gothic *Naenia*

typica, the dog's tooth *Lacanobia suasa*, the pine beauty *Panolis flammea*, the lead-coloured drab *Orthosia populeti*, the black rustic *Aporophyla nigra*, the tawny pinion *Lithophane semibrunnea*, Webbs wainseot *nonagria sparganii*, the rosy marbled *Elaphria venustula* and the buttoned snout *Hypena rostralis*.

Finally, for the West Kent portion of the London Area, Mr J. M. Chalmers-Hunt took a male vestal at West Wickham on 29 August 1987.

V.C. 17 Surrey

At North Cheam during 1987, Mr R. McCormiek added six species of larger moth to his garden list. These comprised five common species – the leopard *Zeuzera pyrina* on 29 June, the dark-barred twin-spot carpet *Xanthorhoe ferrugata* on 8 August, the waved yellow *Hydrelia flammeolaria* on 29 June, the grey birch *Aethalura punctulata* on 4 June and the orange sallow *Xanthia citrigo* on 9 October – and one particularly noteworthy insect in the form of the dotted chestnut *Conistra rubiginea*. This attractive moth is an extremely local insect nationally, being found principally in the Hampshire-Surrey border area on the Bagshot sand. It also occurs, however, on the greensand and wealden clay of the North Downs in Surrey and this is probably the source of the North Cheam example. This is the only occurrence of the dotted chestnut in the London Area in recent years. During 1988, Mr McCormiek captured a further five species worthy of mention here. These were the early tooth-striped *Trichopteryx carpinata* on 19 April, the chocolate-tip *Clostera curtula* on 5 May, the chamomile shark *Cucullia chamomillae* on 16 May, the bordered straw *Heliothis peltigera* on 21 September and finally the star of the show in the form of the marsh oblique-barred *Hypenodes turfosalis* on a date in July. This tiny moth is known in the London Area from only three other sites, all in Surrey (Weybridge in 1953 and 1958, Black Pond, Esher on 31 August 1955 and Dulwich on 10 July 1957).

Mr A. and Mrs O. Hall, who have been regular contributors of records, moved to Mugswell recently and have set about recording moths in this somewhat neglected bit of our area. Three particularly noteworthy records have already been made: an early tooth-striped *Trichopteryx carpinata* was captured on 8 April 1988; a scalloped hazel *Odontopera bidentata* was noted on the exceptionally early date of 15 April 1988 inevitably causing speculation that it may have hibernated; and finally an example of the immigrant delicate *Mythimna vitellina* was captured on 15 October 1988 – only the thirteenth record for the London Area.

A most impressive list of 203 species taken at actinic light in his garden at Ashted in 1987 was sent by Mr G. Geen. Many species with oak *Quercus*-feeding larvae would seem to indicate nearby Ashted Common as a source. The best was a festoon *Apoda limacodes* noted on 10 July and, perhaps surprisingly, our only recent record. Ashted Woods are a classic locality for the species in our area; elsewhere within twenty miles of St Paul's Cathedral it has been noted at Shooter's Hill, Swancombe and Dartford in the last century, West Wickham and Bookham Common during the first half of the present century, then in the fifties at Ruislip. Other notables include a great prominent *Peridea anceps* on 7 May, a rosy footman *Mitochrista miniata* on 7 July, the four-dotted footman *Cybosia mesomella* on 30 June and again on 4 July, dotted rusties *Rhyacia simulans* on 25 August and 18 September, a stout dart *Graphiphora augur* on 7 July, three triple-spotted elays *Xestia dirapezium* from 15 to 22 July, a blossom underwing *Orthosia miniosa* on 24 April, sixteen black rusties *Aporophyla nigra* on the eighteen nights from 16 September to 4 October, three Blair's shoulder-knots between 18 and 28 October, a suspected *Parastichtis suspecta* on 28 July and the waved black *Parascotia fuliginaria* on three nights between 16 July and 1 August. It is of interest to note the total number of moth/nights for some common species; these include 161 for the

riband wave *Idaea aversata*, for the garden carpet *Xanthorhoe fluctuata* – 168; the willow beauty *Peribatodes rhomboidaria* – 225, the heart and club *Agrotis clavis* – 131, the heart and dart *A. exclamatoris* 443, the large yellow underwing *Noctua pronuba* – 1,056, the lesser yellow underwing *N. coines* 115, the pale mottled willow *Caradrina clavipalpis* – 178, the uncertain *Hoplodrina alsines* – 263 and the rustic *H. blanda* – 39. The trap was run on a total of 135 nights. 1988 proved to be an inferior year to 1987 both in the number and diversity of the species recorded, July in particular being poor. The numbers of common species normally most abundant in July, such as the dark arches *Apamea monoglypha* and the July highflier *Hydriomena furcata*, were very much down on the earlier year whilst the total number of species recorded fell to 156. Notwithstanding this, no fewer than 36 species were trapped in 1988 additional to the list obtained for 1987. Most important was a single scarce tissue *Rheumaptera cervinalis* which seems to be the first for our part of Surrey since examples were taken at East Sheen in 1930 and the only record for our entire area since 1972. Other notables included the early tooth-striped *Trichopteryx carpinata* taken singly on 8 and 9 May and for which there are relatively few records in our area of operations. The heart and club *Agrotis clavis* proved common, with 68 noted between 19 June and 23 July; this seems to be far more common south of the Thames in Kent and Surrey than it does elsewhere in the London Area. Another essentially 'southern' species is the reddish light arches *Apamea sublustis*, which is confined to the chalk downs in this region; two were taken, singly on 26 and 28 June. A sprawler *Brachionycha sphinx* was taken on 10 November and is another moth with very few London records in recent years. Finally, four waved blacks *Parascotia fuliginaria* were taken between 5 and 25 July, further confirming the recent spread of this attractive noctuid. A spell of mild weather at the end of December 1988 induced Mr Geen to operate his trap in an otherwise slack period at the end of a relatively poor year. He was rewarded by some late flying moths including the December moth *Poecilocampa populi* on 10th, a chestnut *Conistra vaccinii* on 13th, a winter moth *Operophtera brunata* on 15th, a brick *Agrochola circellaris* on 19th and a mottled umber *Erannis defoliaria* on Christmas Eve.

Elsewhere in Surrey during 1987, Mr S. Gale recorded the maiden's blush *Cyclophora punctaria* on 18 and 29 August, the flame carpet *Xanthorhoe designata* on 3 and 15 September, the phoenix *Eulithis prunata* from 16 to 22 August, with three on 18 August, and the black rustic *Aporophylla nigra* on 19 and 20 September, all from Banstead, whilst at Sutton on 29 April he noted a hibernated buttoned snout *Hypena rostralis*. During 1988 Mr Gale reports a wood carpet *Epirrhoe rivata* from his garden at Banstead on 30 June. There seem to be only two valid recent records for this species which some observers confuse with the sharp-angled carpet *Euphyia unangulata*. Other garden noteworthies for 1988 included a reddish light arches *Apamea sublustis* on 6 July and five autumnal rustics *Paradiarsia glareosa* from 9 to 22 September. Finally, on 14 December he noted the rarely reported northern winter moth *Operophtera fagata* at Banstead Station.

Banstead Downs also produced several reasonable moths for Mr D. Coleman during 1988. On 13 June he captured a clouded buff *Diacrisia sannio*, a very scarce moth in our area for which the last record, also at Banstead Downs, was made in 1975 by R. McCormick. The beautiful brocade *Lacanobia contigua* is probably more under-recorded than rare on the chalk of the southern half of the London Area, though there are very few recent reports. Mr Coleman records three from 14 to 28 June. The round-winged muslin *Thumatha senex*, another rarely reported insect, provided a satisfactory conclusion to June, coming on the 28th, but then July produced a four-dotted footman *Cybosia mesomella* on 11th.

As always, Mr B. Skinner's trap at South Croydon produced a number of good records. In 1987 the undoubted highlight was a slender burnished brass

Diachrysia orichalcea on 25 August, the first for the entire of Surrey and only the sixtieth for Britain! There is one previous London Area record – of one 'taken in the London district in the mid nineteenth century by J. F. Stephens' (Barrett vi: 102). Still on the subject of immigration, there were a number of vestal moths *Rhodometra sacraria* in Mr Skinner's trap during 1987, with a total of four males and three females on four nights in August and seven males and one female on a total of six nights in September; all were captured in the four-week period between 21 August and 20 September. Of previously recorded residents a dotted rustic *Rhyacia simulans* on 6 July deserves mention. New records for his trap in that year were the purple bar *Cosmorhoe ocellata* on 2 July, the brown scallop *Philereme vetulata* on 16 July, the small rivulet *Perizoma alchemillata* on 28 July, the streak *Chesias legatella* on 27 October, the peacock *Semiothisa notata* on 16 July, a white line dart *Euxoa tritici* on 31 July and the brown-line bright-eye *Mythimna conigera* on 16 July. In 1988 a tawny pinion came to light on 25 March and then, on 2 May, a scarce prominent *Odontotia carmelita*, both species being somewhat uncommon across our area. The buttoned snout *Hypena rostralis* was noted on 19 June, new to Mr Skinner's garden list and on the same night he captured a halved gynandromorph of the heart and dart *Agrotis exclamationis*. This latter insect was exhibited at the British Entomological and Natural History Society's annual exhibition in 1988. Another new species in this second year was the grass rivulet *Perizoma albulata*, another apparently rare insect in the London region, whilst on 30 August a male vestal was captured.

A B.E.N.H.S. trip to Nunhead Cemetery on 28 May 1985 produced a few interesting moths. Species such as the seraphim *Lobophora halterata*, the yellow-barred brindle *Acasis viretata* and the pale oak beauty *Serraca punctinalis* seem to indicate an established woodland community here. A female ab. *fuscata* of the waved umber *Menophra abruptaria* taken by Mr Skinner on this trip produced eggs which resulted in an unusual offspring with a typically marked though much darker than usual upperside to the wings and a melanic underside.

At Purley, Mr P. Sellar records a good year in 1987 for the willow beauty *Peribatodes rhomboidaria*, the large yellow underwing *Noctua pronuba*, the marbled beauty *Cryphia domestica*, the mouse *Amphipyra tragopoginis*, the dunbar *Cosmia trapezina* and the phoenix *Eulithis prunata*, though that same year was apparently less favourable for the buff ermine *Spilosoma luteum*, the white ermine *S. lubricipeda* and the angle shades *Phlogophora meticulosa*, numbers of which were lower than usual. In spite of the generally poor season that year, which was not greatly helped by foxes chewing the cable to the moth trap, nineteen new macros were added to his garden list bringing the total for Purley to 196. Most of the additions were fairly widespread species though the pine beauty *Panolis flammea*, taken on 28 April, is either very local or else poorly recorded in the London Area. In central areas the lack of pine trees may account for the paucity of records; in the peripheral zone, however, under-recording is a more likely explanation. One late record for Purley, from 1986, warrants mention here as I inadvertently forgot to include it in my review of 1985 and 1986. This relates to the alder kitten *Furcula bicuspis* – only the fourth recent record (1980 to present) for the London Area. A single example was taken at light on 27 June together with a single sawfly kitten *F. furcula*.

By the end of 1988, the Purley garden list had passed the 200 mark with the addition of a further thirteen species. Most of these were common moths which would doubtless have turned up in due course in any event (and no doubt there are several more to come), though the barred rivulet *Perizoma bifaciata* is one which is apparently a less than common insect in the London Area generally; an example turned up on 16 August. The aberrant form *fimbriata* of the small fan-footed wave *Idaea biselata* was captured on 30 June whilst there were larger than usual numbers of the lunar underwing *Omphaloscelis lunosa* in September. A large ranunculus *Polymixis flavicincta* on 18 September fits well with the

pattern of a species common south of the metropolis, but seemingly rare in London itself, as well as further out on the north side of the Thames.

A welcome addition to the records has been forthcoming from the extreme southern edge of the London Area at Buckland, courtesy of Mr I. Dodd. A total of 131 macros was recorded here in 1987 including several of note: the flame carpet *Xanthorhoe designata* taken on 31 May has only scattered records for the London Area, all in the southern third, the wood carpet *Eppirhoe rivata* on 24 June has already been mentioned above. The phoenix *Eulithis prunata* taken on 15 July seems to have appeared at a number of localities in 1987 though it remains mostly southern in the London Area, the early tooth striped *T. carpinata*, of which there are only six recent records, was captured on 5 May, the minor shoulder-knot *Brachyloimia vininalis*, noted twice, on 14 and 15 July is a poorly recorded moth with only twelve post-1979 records, the reddish light arches *Apamea sublustris* taken on 29 June and 7 July is confined to the North Downs in our area and the small purple-barred *Phytometra viridaria* noted on 14 July is a day-flier which is sometimes active at dusk and attracted to light traps is rarely recorded and probably overlooked in our area.

Some interesting species were noted by Sir John Dacie at his garden trap in Wimbledon during the two-year period under review. The purple thorn *Selenia tetralunaria* taken on 20 July 1987 was new to his list whilst others of note in that year were the peach blossom *Thyatira batis* on 27 June, the least carpet *Idaea vulpinaria* on 6 and 8 July and single vestals *Rhodomestra sacraria* on each of 30 August and 3 and 17 September. In the following year a grey form of the scarce bordered straw *Heliothis armigera* came to light on 22 October, a date when others were reported elsewhere in Britain indicating an immigrant origin.

To complete the round-up of our portion of Surrey are a number of records made by Mr G. A. Collins, the Lepidoptera Recorder for the whole of that county. In his garden at South Croydon Mr Collins reports nine species new to his existing list, four in 1987 and five in 1988. In the former year the juniper carpet *Thera juniperata* stands out as being of interest; it has suddenly appeared at two other localities in the London Area in the two years under review. The tissue *Triphosia dubitata* was noted on 27 August 1988 and is only otherwise reported from Riddlesdown in our part of Surrey in recent years. In the south-west of our area, at Bookham Common, Mr Collins records the least black arches *Nola confusalis* on 1 June 1987, our only recent record away from Epping Forest in Essex. The same night also produced a rosy marbled *Elaphria venustula*. Several notables captured in the following year on the Common include the first orange moth *Angeronia prunaria* in the London Area since 1951 – also the first in our London portion of Surrey since 1911 – and galls of the sawfly clearwing *Synanthedon flaviventris* for which species our last record heralds from the same locality as long ago as 1954. Clearly there has been a deal of 'under-recording' in this part of the world!

V.C. 18 South Essex

Sadly, there are few records for 1987 and 1988 from this formerly well-recorded portion of our area. At Upminster, during 1988, Mr G. S. Robinson was sitting quietly in his living-room one evening when he was suddenly joined by a dark grey moth which entered via a window. This turned out to be a Blair's shoulder knot *Lithophane leautieri*, not recorded in this part of the Essex area until now. Nearby, at Grays, the Rev. D. Agassiz took an example of the bordered gothic *Heliophobus reticulata* on 27 June 1987. This is a somewhat locally distributed moth, found in the south-east and East Anglia. The present record is only the third recent occurrence in the London Area, the others being at Ingrave, Essex in 1983 and at Dartford, Kent in 1984.

A total of 26 macros recorded in his garden at Hainault by Mr C. Griffin may not seem, initially, to be a particularly remarkable achievement – except that

this was achieved by standing in the garden with a hand-held torch to attract the insects! Two species of some interest were the lilac beauty *Apeira syringaria* and the bullrush wainscot *Nonagria typhae*. It is worth noting that all 26 common moths were new tetrad records indicating the scope for assistance by even the most amateur of lepidopterists!

At the Essex Naturalists' Trust's newest reserve at Gernon Bushes, near Epping, Mr T. King and I spent the night of 31 May/1 June 1988 with four moth traps and produced only 39 species of macro in five hours. Most notable amongst these was the brindled white spot *Ectropis extersaria* which appeared in some numbers.

An L.N.H.S. field trip on 25 June 1988 found half-a-dozen stalwarts braving the less than ideal weather conditions for a night of trapping in Epping Forest looking, in particular, for the striped wainscot *Mythimna pudorina* which had been reported from the Forest a few years before. Setting up traps on the southern portion of Sunshine Plain we soon had numbers of freshly emerged moths in the traps along with examples of the melanistic form of the lobster *Stauropus fagi* (a form which dominates the Epping Forest population), the maple prominent *Ptilodontella cucullina* and a single poor example of the four-dotted footman *Cybosia mesomella*. Later, upon returning to the cars, we located pairs of *M. pudorina* in copula on grass stems.

V.C. 19 North Essex

No records of particular note have been received for this part of our area for 1987/1988.

V.C. 20 Hertfordshire

At the Capel Manor Environmental Centre, near Waltham Cross, a Robinson trap was run by Mr B. Taggart from 8 April to 6 November 1987 and as a result a list of 140 species of larger moth was forthcoming. Many were of interest including eight twin-spotted quakers *Orthosia munda*, a moth seldom seen in numbers at light and a clouded magpie *Abraxas sylvata* on 9 June – another species for which there are no other records for the recent period (1980 to present). Vestals *Rhodometra sacraria* were noted on 22 September (one), 24 September (two) and 25 September (two), a great prominent *Peridea anceps* on 9 June (our only post-1979 record for the London portion of Hertfordshire) and an orange sallow *Xanthia citrigo* on 6 October. Other 'useful' species noted during 1988 included the sharp-angled carpet *Euphyia unangulata*, for which there is only one other recent London Area record – from Hampstead – and the slender pug *Eupithecia tenuiata* which will no doubt prove to be under-recorded rather than rare in our area. Two brown-tails *Euproctis chrysorrhoea* were noted on 26 July and an example of the immigrant dark sword grass *Agrotis ipsilon* on 18 October. A healthy ten Blair's shoulder-knots *Lithophane leautieri* were captured between 27 September and 21 October.

V.C. 21 Middlesex

Ms Anna Hughes again ran a light trap in her garden at Enfield during 1987 and 1988, adding a number of new records for this poorly recorded part of north Middlesex. During 1987 the foxglove pug *Eupithecia pulchellata* and the barred yellow *Cidaria fulvata* were useful additions, as was Blair's shoulder-knot *Lithophane leautieri* on 10 October. The immigrant vestal *Rhodometra sacraria* arrived on 21 August and the more frequent immigrant, the pearly underwing *Peridroma saucia* was noted on 12 and 17 September. Particularly noteworthy in 1988 were the double lobed *Apamea ophiogramma* on 19 July, the dingy shears *Enargia ypsillon* on 17 July and the least carpet *Idaea vulpinaria* on five dates in the same month. Other interesting records included the golden plusia *Polychrysis moneta* on 19 June, a moth not often reported in our area, a

common lutestring *Ochropacha duplaris* on 25 June and a small angle shades *Euplexia lucipara* on 2 August 1988.

Mr N. Bowman was lucky enough to find and photograph a nice example of the Clifden nonpareil *Catocala fraxini* on the wall of a building at Markfield Recreation Ground in the Tottenham area of north London on 18 August 1988. It was the twenty-third example for the London area and only the twelfth this century.

A single larva of the yellow tail *Euproctis similis* was found feeding on heather in a garden at Ruislip by Mr J. A. Tester on 1 October 1988. This is almost certainly a new foodplant record for this species. Scorer (1913) lists *Betula*, *Crataegus*, *Fagus*, *Pyrus*, *Quercus*, *Rosa* and *Salix caprea*, whilst Heath and Emmet (1979) list *Crataegus*, *Prunus spinosa*, *Quercus*, *Betula*, *Salix* and 'other trees'. On the same subject, of new foodplants, a larva of the peppered moth *Biston betularia* was found feeding on the leaves of great burnet *Sanguisorba officinalis* at Fryent Country Park in September 1987 by Mr L. R. Williams. This was reported in the *Entomologist's Rec. J. Var.* for 1988.

At Wraysbury, Mr S. Church took examples of Vine's rustic *Hoplodrina ambigua* at m.v. light in late June 1987 and again in early July of the same year – both rather early dates for this species in the London Area.

At Osterley Park, Mr J. D. Bradley captured the vestal moth on 30 August 1987 and again on 4 September in the same year.

Amongst the many records sent in by Mr R. A. Softly from Hampstead Heath that of the July belle *Scotopteryx luridata* stands out as particularly noteworthy. Five examples were disturbed from gorse *Ulex* on the Heath between 30 June and 13 July 1987. One adult was also taken at actinic light in nearby Ken Wood on 1 July 1987. These are Mr Softly's first records of this species here in ten years of study; the moth is generally rare in the London area, the only other recent records being from Dartford in 1983 and Bexley in 1987, both in Kent. Mr Softly has also communicated some interesting and useful observations on the common marbled carpet moth *Chloroclysta truncata*. He notes that there is a gap of about seven and a half weeks between the spring and autumn broods at Hampstead and by way of example provides comparative figures for the years as follows:

1984: last spring record 18 July;
first autumn record 9 September;
gap 53 days.

1987: last spring record 12 July;
first autumn record 2 September;
gap 52 days.

It is interesting to note the constancy of the gap: the spring brood of 1987 was apparently about a week earlier than in 1984 but the periodicity of the cycle was unaffected.

From nearby Hampstead Garden Suburb Mr R. T. Lowe recorded 157 species of macro at his m.v. light during 1987 from the first on 22 February (a pale brindled beauty *Apocheima pilosaria*) to the last on 27 December (a satellite *Eupsilia transversa*). The vestal was noted on 21 August (a female) whilst the dotted rustic *Rhyacia simulans* and Blair's shoulder-knot *Lithophane leautieri*, both rapidly spreading species in our area, were noted in September and October respectively. The bordered white *Bupalus piniaria*, noted here on 30 June, is apparently very local in the London Area, though becoming more widespread in the outlying areas where there are more pine trees; records from the more urbanised central zone are few in number.

A number of moths recorded from Crane Park by Mr P. J. Belman during 1987 included the small seraphim *Pterapherapteryx sexalata* on 29 July – a moth which is either very rare or else grossly under-recorded in the London Area.

The larvae are sallow *Salix* feeders, typically in damp woods or in marshy areas. Mr Belman also notes this moth from Isleworth Ait in the River Thames on 18 July 1987. Mr Belman has also carried out a number of faunistic surveys on Hounslow Heath during 1987 and amongst the moths he records are the shears *Hada nana* and the hedge rustic *Tholera cespitis* on 31 August, the black rustic *Aporophyla nigra* on 4 October and the streak *Chesias legatella* on 31 October.

A welcome addition to the sources of Middlesex records has been that provided by Mr M. Thain and the boys of Harrow School. A number of common species recorded in what was by no means a favourable first season have provided a great many additional dots for the distribution maps. In particular a *Zygaena* larva found feeding on greater bird's-foot trefoil in the school grounds gave temporary cause for hope that the heathland race *decreta* Verity of the five-spot burnet *Z. trifolii* may not actually be extinct in the London region. Sadly, however, when the adult emerged it was only a narrow-bordered five-spot burnet *Z. lonicerae* – a widespread and common species. It is, never the less, an interesting foodplant record, since *Z. lonicerae* does not usually feed on this plant other than in marshland biotopes.

Mr and Mrs A. and O. Hall located a brimstone moth *Opisthograptis luteolata* and a garden tiger *Arctia caja* inside the London Transport bus garage at Hanwell on 21 August 1987, presumably drawn in by the lights.

From his trap at Pinner Mr W. E. Minnion recorded 152 species during 1987, including ten newcomers, bringing his overall total for 1980-1987 to 249 species. These additions included the December moth *Poecillocampa populi*, the grey shoulder-knot (one each in spring and autumn), six small fan-foots *Herminia nemoralis* and a single rosy marbled *Elaphria venustula*. The small elephant hawk *Deilephila porcellus* was noted for the second time, the last record being made in 1983 here and the brown-tail *Euproctis chrysorrhoea* (a single example) was recorded for the first time since 1980. Happily, the plague of this species seems to have all but vanished in Middlesex (see also comments for Buckingham Palace Garden under the Inner London heading). Other less common moths that were noted at Pinner in 1987 include the ingrained clay *Diarsia mendica* (1 in 1986 and 1 in 1987), the shoulder-striped wainscot *Mythimna comna* and the pink-barred sallow *Xanthia togata* (again, 1 in 1986 and 1 in 1987). In the following year the black rustic *Aporophyla nigra* was added to his list (surely this must be everywhere in our area by now?) and examples of the dark chestnut *Conistra ligula* and the clouded-bordered brindle *Apamea crenata* put in an appearance after a prolonged absence. Mr Minnion comments also on the establishment of Blair's shoulder knot in his area of Middlesex. From the first example in 1982, the moth was not noted again until 1986 when two were captured. In 1987, however, there were eleven and the following year twelve!

Over at Northwood, Dr A. M. Gorge recorded 138 macros in his garden trap during 1987 of which a number warrant mention here. The lead-coloured drab *Orthosia populeti* was recorded on 13 April and is apparently a scarce moth in our area. The May highflier *Hydriomena inphiviata* was noted on 29 June as was a varied coronet *Hadena compta* and a waved yellow *Hydrelia flammeolaria*. The flame carpet *Xanthorhoe designata* was taken on three dates in August; this is still an extremely local though quite widespread insect in our area. The bird's wing *Dypterygia scabriuscula* was captured on 12 June, the six-striped rustic *Xestia sexstrigata* on 17 and 19 August, the grass emerald *Pseudoterpna pruinata* on 17 August and the juniper pug *Eupithecia pusillata* on 19 August.

Whilst on the subject of Northwood, I had occasion to visit the area myself during 1987 and whilst in 'The Red Kipper' fish and chips shop in the High Street I caused much merriment amongst the customers by asking to be allowed to examine the contents of the tray under the electrocution trap mounted on the wall. Amongst several moths present was a single vestal which must have

entered the trap between 20 and 25 August that year.

At Hillingdon, Dr George records examples of that regular immigrant the dark sword grass *Agrotis ipsilon* on 6 September and 3 October. It is certain that all spring and early summer examples of this species are immigrants, though in warm, dry summers these will produce a second generation in the autumn whose numbers are swollen by further immigration. However, because few people record dates of captures of this, as well as other common immigrants, patterns of influx and breeding in the London Area cannot be worked out for the present. Dr George also notes the pearly underwing *Peridromia saucia* here, a black rustic *Aporophyla nigra* on 3 October and a total of eight Blair's shoulder-knots *Lithophane leautieri* between 3 and 30 October. Elsewhere, at Poor's Field, Ruislip, Dr George notes the shoulder stripe *Anticlea badiata* on 7 April, and at the Harvil Road railway-cutting a colony of the narrow-bordered five-spot burnet *Zygaena lonicerae* on 5 July. This last species is also recorded by him from Bishop's Wood in 1987 along with the orange underwing *Archiearis parthenias* on 18 April and the speckled yellow *Pseudopanthera macularia* on 7 June. Speckled yellows were also seen at Copse Wood on 8 May and orange underwings at Bayhurst Wood on 25 April. Five larvae of the starwort *Cucullia asteris* were recorded at Coppermill Down on 14 June whilst at Maple Cross Nature Reserve during 1987 three extra species of macro were added to the reserve list in the large twin-spot carpet *Xanthorhoe quadrifasciata*, the double lobed *Apamea ophiogramma* and the wormwood pug *Eupithecia absinthiata*.

Other records of note sent by Dr George include a scarce prominent *Odontesia carmelita* taken by him and Mr M. J. Hough at Bayhurst Wood on 30 April 1988 (this is our only recent record of this species north of the Thames in our area), and finally a humming-bird hawk-moth was noted on 28 June 1987 at the Maple Lodge Nature Reserve by Messrs Currie, Williams and Rusher.

V.C. 24 Buckinghamshire

No records have been received from this part of our area for 1987/88.

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Book Review

The Moths and Butterflies of Great Britain and Ireland, Volume 7, part 1: Hesperidae – Nymphalidae. The Butterflies. Edited by A. Maitland Emmet and John Heath. Harley Books, Colchester. 1989. 380pp., including 24 colour plates, 22 text figures and 83 maps. £49.50, hardbound. ISBN 0 946589 25 9.

In spite of its numbering, this is the fifth volume in a series of eleven, volumes 1, 2, 9 and 10 having already appeared. A review of volume 10 appears in *The London Naturalist* 63: 122-123.

My original reaction upon learning that volume 7 had been split into two parts was one of dismay – principally at the prospect of having to part with yet more money to get part two! Having now received my copy of part 1, however, I can fully appreciate the necessity of making the split; to continue as planned and include the Lasiocampidae to Thyatiridae would have made the book physically impossible to use unless valuable information was edited out.

The result is surely the most comprehensive and useful book on British butterflies of all time. The authoritative and comprehensive text will appeal to layman and expert alike and will make this the standard reference work for very many years to come. It covers 111 species, including rare adventives, and illustrates every species and subspecies as well as many aberrations in a series of superbly executed colour plates by a new artist, Richard Lewington. This change alone has done much to enhance a series which, to be blunt, was not really measuring up to its image. The high cost of the volumes coupled with the exceedingly poor quality of the plates in earlier volumes had started many potential customers for the whole series thinking very carefully about the worthiness of such a venture. Indeed, had not Harley introduced paperback versions I suspect that, until now, the series might have failed. But if succeeding volumes are of the same high degree of excellence as this one then the series is surely saved.

Following a fairly lengthy (but quite justified) tribute to the late John Heath by the publisher, the work proper begins with a fifteen-page article by Maitland Emmet on the vernacular names and early history of British butterflies. Emmet's chapter reaches – even exceeds – his usual very high standard, being scholarly yet clear and concise as well as fascinating reading. Another chapter, authored jointly by Mike Morris and Jeremy Thomas, deals with the re-establishment of insect populations (with special reference to butterflies). I have no doubt that there are a great many readers of this journal that would benefit from reading this comprehensive article. A British checklist followed by a short historical review of butterfly classification then precedes the main work on the butterflies themselves.

Those who are not collecting the series will perhaps be unaware of the value of this book as a volume on its own. Each separate species is treated in the following manner. First the taxonomy is listed. A full description of the adult(s) follows then an account of variation. Life history is next dealt with in great detail, with sections on the egg, larva, pupa and adults. A considerable amount of detail, including much new information and corrections of earlier errors published elsewhere is incorporated in this section. Distribution is covered next. The maps are based on the *Atlas of Butterflies in Britain and Ireland* by J. Heath, E. Pollard and J. A. Thomas (reviewed in *The London Naturalist* 64: 129), incorporating over 13,500 additional records to the end of 1988 and many corrections to those original maps. Vernacular names and early history bring up the rear giving here a great deal more detail than possible in Emmet's introductory chapter. The coloured plates are together in a section at the rear of the book; this should make comparisons relatively easy, though it seems a pity that the species of doubtful status in this country are separated into four separate plates at the rear rather than being placed in their correct taxonomic position.

Although clearly explained in the Preface, I find the new classification and nomenclature a little trying. The entire fauna is placed in the two superfamilies Hesperoidea and Papilionoidea whilst the seven families of the latter are here reduced to four with Nemeobiidae, Satyridae and Danaidae being reduced to sub-family level. The familiar genus *Strymonidia* Tutt is sunk and replaced with *Satyrion* Scudder whilst *Zerynthia* Ochseneimer replaces *Parnalius* Rafinesque. Berger's clouded yellow is now *Colias alfajariensis* Berger. I do sometimes wish that for a group of insects so well studied as British butterflies we could at least agree on a standard name! Dare I suggest that we accept what is printed here and stick with it – and to Hades with the International Commission on Zoological Nomenclature!

I find it difficult to criticise this book so I must turn to the series. It is a pity that we are (perhaps inevitably), seeing the 'easy' volumes being produced first when what we really need are the volumes on gelechiids and colcophorids to name but two rather tricky areas of lepidopterology. I still find the excuses for the inordinately long gaps between volumes a little tiring. The next volume is always going to be produced 'on schedule' yet it never is! Volume 7 part 2 *should* be published by the time you are reading this review – experience suggests that this will not be the case. For such an expensive book I find a white dust-wrapper a little foolish. Look along anyone's bookshelf and it is obvious what I mean – even in some of the better libraries!

I conclude with the recommendation that all readers with even passing interest in butterflies buy this one volume – it is simply superb.

COLIN W. PLANT

The Dragonflies (Odonata) of London: the Current Status

by STEPHEN J. BROOKS*

Summary

The Odonata occurring within 20 miles of St Paul's Cathedral were surveyed between 1983 and 1988. Records were received from over 500 localities representing about 33% of the survey area. Twenty-five species were found to be breeding. Of these 11 were common and widespread, but 10 were restricted to just a handful of sites. By comparing the results of the present survey with the last comprehensive London-wide survey by Cynthia Longfield in 1949, it has been possible to assess changes in the distribution of dragonflies over the last 40 years. Many of the nationally common species have remained static and some have even increased. However, most of the rarer species have declined and two have apparently become extinct.

Introduction

This report presents the results of a survey of the dragonflies that occur within a 20-mile radius of St Paul's Cathedral (the London Natural History Society recording area), conducted between 1983 and 1988. Owing to the escalation in the value of land in London, especially in the last decade, the pressure on the remaining pockets of undeveloped land has intensified making the toe-hold that wildlife has in the capital more precarious than ever. In addition, there are further threats from pollution and degradation of biotopes arising from either neglect or unsympathetic management. The aim of this survey is to establish which dragonfly species are breeding in the London Area and where they occur. The results should help conservationists and planners identify which nationally rare species occur in London, the species that are locally rare and those sites which support large assemblages of species. This may go some way to conserving dragonflies in the capital by identifying the most important dragonfly sites.

There is a long history of dragonfly recording in the London Area. The earliest records that I have traced are from a collection made by Leonard Plukenet in the late 17th century. His specimens were taken in localities such as Islington and Hampstead (Hammond 1975) and included seven species of dragonfly, six of which, *Calopteryx splendens*, *Pyrhosoma nymphula*, *Coenagrion puella*, *Aeshna cyanea*, *Libellula depressa* and *Sympetrum striolatum*, are still common in the area. The seventh, *Brachytron pratense*, no longer occurs in London; indeed the nearest populations are many miles away on the grazing marshes of Essex and Sussex. However, this record gives an insight into what parts of London must have been like before they were swallowed up by the urban sprawl. Later, there were several active Victorian collectors, such as Doubleday and the Champion brothers, who concentrated on Epping Forest and whose work has recently been reviewed by Benton (1988). The first survey to cover the London Area as a whole was published by Cynthia Longfield (1949). She listed 32 Odonata species of which 27 were thought to be breeding. The present survey is the first to have been published since 1949 covering the entire L.N.H.S. area. By comparing the results of this survey with those of Longfield, any changes in the odonate populations during the last 40 years can be assessed. Unfortunately, Longfield's report is rather vague about the precise location of many of her records and it is not clear how comprehensive her survey was, making any later comparisons somewhat subjective.

Although I intend to continue the survey, it now seems appropriate to review the data that I have collected. I am attempting to achieve a balance between

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the maximum possible coverage and ensuring that the distribution maps stay topical. The face of London is continually changing and sites suitable for Odonata are constantly being created or destroyed. However, over a six-year period it is unlikely that the picture will have changed significantly. The maps are certainly incomplete and it is possible that major Odonata sites are still unrecorded. Nevertheless, distinct trends are detectable from the data and I think that meaningful conclusions can be drawn about the distribution of dragonflies in the capital.

Methods

The survey was launched in 1984 but I received sufficient records covering the previous year to make it worthwhile including records from 1983. By the end of 1988 I had received records from 528 sites covering about 33% of the London area (Map 1). However, I have received more records from the eastern half of London than from the rest, so this bias in the coverage should be borne in mind when interpreting the maps. The records, stored on an Amstrad PCW8512 using the software package *Cardbox*, are indexed under the following headings: locality name; 100km square; six-figure grid reference; tetrad; vice-county; borough or district; whether record was made at standing, flowing or away from water; species name (including evidence of breeding); year of record; name of recorder. All records are also plotted on maps of the L.N.H.S. area using a 2km (tetrad) grid. For reference, each tetrad has a unique four-figure number. The first two figures give the number of the ten-kilometre square and the last two refer to the particular tetrad. The tetrads are numbered evenly from 00 in the bottom left corner to 88 in the top right corner of each ten-kilometre square. So, for example, the only tetrad in which *Ceriagrion tenellum* (Map 13) occurs in London would be referred to as 16T22.

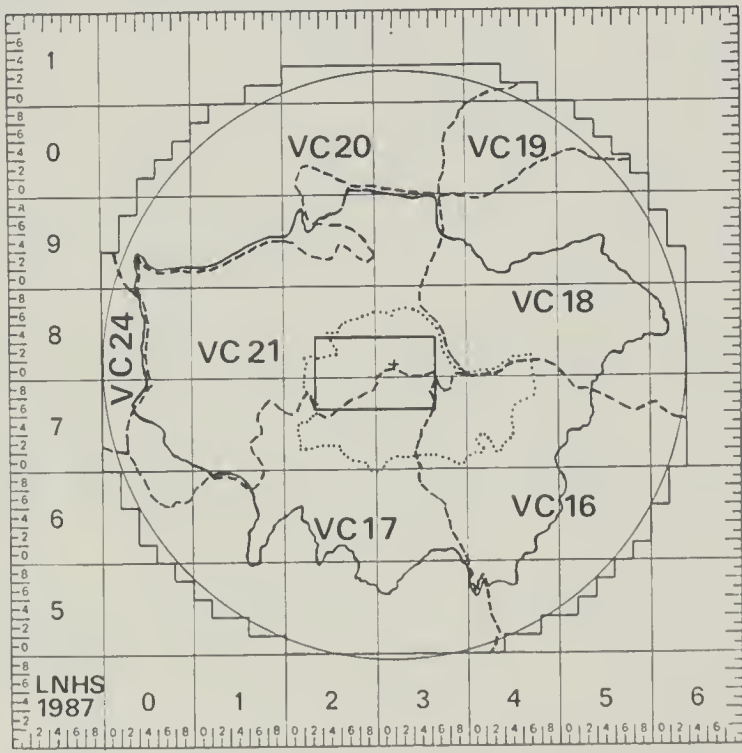


FIG. 1. The Society's Recording Areas. London County Council area, — Greater London area, --- Watsonian Vice-counties - VC 16 West Kent, VC 17 Surrey, VC 18 South Essex, VC 19 North Essex, VC 20 Herts, VC 21 Middlesex, VC 24 Bucks. The central rectangle shows the Society's Inner London area with St Paul's Cathedral marked by a cross.

The maps (Maps 1-26) show confirmed sightings, so do not necessarily indicate breeding records. Dragonflies, particularly libellulids and aeshnids, are frequently encountered away from water. Be that as it may, I think it reasonable to assume that even in these cases there is often a suitable breeding locality within 2km of the sighting. In 1988 recording cards, specifically designed for this survey, were introduced with the aim of standardising the data received.

Figure 1 shows the L.N.H.S. recording areas and was first published in *The London Naturalist* 66 (1987). Comparing the maps with this figure enables the occurrence of species to be plotted readily within Inner London, the London County Council and Greater London boundaries and the Watsonian Vice-counties. A transparent overlay is available from the Society's Publications Sales Secretary.

The classification follows Hammond (1983).

Species Accounts

BEAUTIFUL DEMOISELLE *Calopteryx virgo* (Map 2)

This is a common species in southern England and Wales, but rare in eastern districts, the London Area being at the edge of its range. It breeds in fast-flowing, shaded streams with a gravelly substrate. Already in 1949 Longfield wrote that it had declined in the London Area during the previous 20 years although it was still to be found on suitable stretches of the Rivers Lea, Roding, Darent, Mole and Colne. Unfortunately, this decline seems to have continued and I have no recent records of the species from the Roding or Mole. However, it has been recorded from Bookham Common (15T26), the Colne Valley near Denham (08T46) and Rickmansworth (09T42), and on the River Gade near Watford (09T86). There is also a 1982 record of it from the River Darent at Lullingstone (56T24). In the Lea Valley, *C. virgo* was discovered on the Old River Lea (30T06) in 1983, but despite intensive searches since then it has not been relocated. Moreover, the river is slow flowing at this point and would appear to be suboptimal as a breeding site for the species.

BANDED DEMOISELLE *Calopteryx splendens* (Map 3)

This species is widespread and common in southern England where it breeds in slow-flowing rivers with a silty bed, and occasionally in standing water localities close to rivers. Unlike *C. virgo*, *splendens* is as common now as it was 40 years ago in the London Area and strongholds include the Rivers Colne, Lea, Roding, Darent, Wey, Mole and western stretches of the Thames. The lack of records from south London probably represents an actual lack of suitable habitat rather than a paucity of recorders. The species appears to be tolerant of a degree of pollution and canalization since it occurs on downstream sections of the Rivers Lea and Thames which have been affected in this way.

EMERALD DAMSELFLY *Lestes sponsa* (Map 4)

Lestes sponsa is one of this country's most widespread species, occurring throughout the British Isles. It is generally restricted to shallow, standing water with luxuriant growths of emergent vegetation. Longfield knew of it from Epping Forest and it was also plentiful on the Surrey commons, but in the past it does not seem to have occurred elsewhere. Although it could not be described as common in London today, *L. sponsa* does appear to have become more widespread and has even penetrated to such inner London sites as the Middlesex Filter Beds (38T46) and Gillespie Park (38T06). This trend is difficult to explain, especially as shallow-water habitats are easily destroyed by scrub invasion or drainage. A similar post-war increase has been reported from Bedfordshire (Dawson 1988), although it was not detected in a survey conducted in Essex (Benton 1988).

SCARCE EMERALD DAMSELFLY *Lestes dryas* (Map 5)

Due to drainage of its breeding sites *Lestes dryas* declined dramatically in Britain after the last war until, by 1971, it was thought to be extinct. However, it was rediscovered in 1983 at two sites on the Thames marshes in Essex. Since then more breeding colonies have been discovered and, although still rare in Britain, it now occurs in several localities in Essex, Kent and Suffolk. Typically it breeds in shallow reed-choked ditches and pools in coastal or estuarine marshes and is tolerant of brackish water. There is only one colony within the L.N.H.S. recording area at Rainham Marshes and the adjoining Ingrebourne Valley. Regrettably, Rainham Marshes are currently threatened by major building and road construction projects. Longfield is not specific about the localities it was known from 40 years ago, but mentions one site in Essex and another in Hertfordshire.

WHITE-LEGGED DAMSELFLY *Platynemis pennipes* (Map 6), Frontispiece.

The white-legged damselfly was once common on slow-flowing rivers in southern England, but is declining due to pollution of its habitats. Longfield described it as common on the Rivers Thames, Colne, Lea, Roding, Mole and Wey. I have no confirmed records from the Thames or Colne but it seems to be holding its own on the other rivers.

LARGE RED DAMSELFLY *Pyrrosoma nymphula* (Map 7)

The large red damselfly is frequently described as Britain's commonest species of dragonfly and it is found in a wide range of biotopes from Lands End to John O'Groats. In London, soon after the last war, Longfield said that it 'swarmed all over the area'. The current distribution map tells a different story. Because it is the first odonate on the wing in the spring, it is possible that the species has been under-recorded in the current survey. However, this seems unlikely since its flying season extends well into the summer and its large size and striking colouration make it an easy species to spot and identify. The apparent decline of the species in London is mysterious. The majority of the present records are from acidic waters and typical sites include several Epping Forests ponds, Hertford Heath (31T04), Black Park (08T02) and Esher Common (16T22).

RED-EYED DAMSELFLY *Erythromma najas* (Map 8)

Most species of dragonflies are not closely associated with particular kinds of plants, but *E. najas* is almost invariably found at large lakes or slow-flowing rivers with extensive growths of floating-leaved vegetation. The males seldom approach the shore, but instead perch on the floating leaves of water lilies or pond weeds in mid-water waiting for the arrival of females. The species is locally common in the midlands and much of southern England, but is rare in the southwest of the country. Although it is still widespread in London, it seems to have declined in the last 40 years since Longfield described it as being plentiful throughout the area. This decrease may be attributable to the loss of large lakes and over-zealous clearance and dredging of waterways which has removed floating vegetation.

AZURE DAMSELFLY *Coenagrion puella* (Map 9)

This species is abundant throughout most of England. It favours the shallow margins of ponds, lakes or sluggish rivers where there are extensive stands of emergent vegetation. The status of the species in London does not seem to have altered significantly since 1949 and it is still largely restricted to outer London. *C. puella* seems to have been unable to penetrate the more built-up parts of London even though suitable habitats are available. However, the species is rarely encountered far from water and this may prevent it dispersing to the widely scattered ponds in inner London. Nonetheless, it will readily colonise

garden ponds when they are in close proximity to existing populations of the species.

VARIABLE DAMSELFLY *Coenagrion pulchellum* (Map 10)

Due mostly to loss of habitats as a result of agricultural intensification, *C. pulchellum* has become uncommon in recent years, although it is still widely distributed in central and eastern England and parts of Wales. It inhabits reed-choked drainage ditches and water meadows and is often abundant where it occurs. The species has always been rare in London and Longfield knew of it only from Weybridge and the Staines district. There are now confirmed records of only one breeding colony from Langham Pond, Runnymede (07T02). The records from the Old River Lea refer to a sighting of several individuals in 1983. However, despite intensive searching since then, the species has not been found again.

COMMON BLUE DAMSELFLY *Enallagma cyathigerum* (Map 11)

The common blue damselfly is distributed throughout the British Isles. It breeds in most standing or slow-flowing water, but its habitat usually includes open stretches of water so it tends to favour larger water-bodies. The species is frequently encountered away from water and is often an early coloniser of newly created ponds. However, it rarely occurs in small garden ponds possibly because they are too densely vegetated. Its status in London seems to have remained unchanged in the last 40 years.

BLUE-TAILED DAMSELFLY *Ischnura elegans* (Map 12)

This species occurs commonly throughout Britain. It breeds in a wide range of standing and slow-flowing aquatic biotopes and will apparently tolerate moderately polluted and brackish waters. In London *I. elegans* is practically ubiquitous and is frequently the only species encountered at a site. It appears to be as common now as it was in Longfield's day.

SMALL RED DAMSELFLY *Ceriagrion tenellum* (Map 13)

This is a species of acid heathland and bog pools. It is local in Britain being restricted to suitable habitats in southern England and west Wales. In 1949 Longfield reported its loss from Epping Forest and could record it only from Esher Common within the L.N.H.S. boundary. It still has a tenuous foothold on the Common but many of the pools it used to breed in have dried up in recent years. This is due probably to a change in management of the Common from wet heathland to woodland with trees being actively planted.

COMMON HAWKER *Aeshna juncea* (Map 14)

Although this species is common in northern and western Britain, especially in upland districts where it breeds in acidic heath and moorland pools, it is rarely encountered in eastern counties. However, within the L.N.H.S. area, the common hawker still occurs on Wimbledon (26T02) and Esher (16T22) Commons as it did in the 1940s. I have received scattered additional records of this species from other parts of London, but it seems unlikely that they represent breeding populations because of the unsuitability of the habitat. Moreover, it is also apparent that the species is frequently confused with *A. mixta* and *A. cyanea*. As a result, some of these records may be erroneous and have not been included on the map.

MIGRANT HAWKER *Aeshna mixta* (Map 15)

Longfield dubbed this species the migrant hawker because it was a regular visitor to southeast England from continental Europe. In recent years it has become fully established in England and now occurs as a resident roughly southeast of line drawn from the Bristol Channel to the Humber estuary. It will readily colonise large ponds and lakes and breeds throughout the London Area.

In the last 40 years it has undoubtedly become more common.

SOUTHERN HAWKER *Aeshna cyanea* (Map 16)

This species is common in the Midlands and southern England and will breed in most standing-water localities. However, it particularly favours woodland and is often the only odonate species which will breed in small, deeply shaded woodland ponds. It is very common in inner London and is probably maintained in these districts because of its readiness to breed in garden ponds. *A. cyanea* made up 75% of the records I received from garden ponds. Such ponds may resemble woodland pools because of their small size and because they are often surrounded by trees and tall shrubs. The southern hawkers is often encountered feeding along woodland rides away from water and several of the records entered on the map were made in these situations. Its status seems to have remained unchanged since Longfield's survey.

BROWN HAWKER *Aeshna grandis* (Map 17)

The brown hawkers is common in central and southern districts of England but is absent from Wales and southwest England. It will readily breed in standing and slow-flowing water but, unlike *A. cyanea*, it avoids shaded woodland ponds. *A. grandis* is the most commonly encountered aeshnid in the London area and will breed in even the most unpromising of urban ponds. If anything, *grandis* may have increased in numbers since Longfield's survey, especially in central London areas where it may have benefited from the many ponds in conservation areas which have been recently created.

EMPEROR DRAGONFLY *Anax imperator* (Map 18)

This species is restricted to southern Britain and breeds commonly in large ponds, lakes and canals. Occasionally it will also breed in garden ponds, sometimes with spectacular results. For example, in one year Philpott (1985) reported over 70 individuals emerging from a small garden pond in Dorset. In London the emperor is widespread and, due to its powerful flight, is easily capable of colonizing inner city sites. In 1987 I observed a female ovipositing in a housing estate pond in the heart of Brixton. Fortunately, this event was filmed by London Weekend Television and was later televised for the enjoyment of millions of other Londoners. Longfield believed that *Anax* had increased considerably since the turn of the century and had quickly colonized bomb craters after World War II. It is still common in the London Area.

DOWNY EMERALD *Cordulia aenea* (Map 19)

Although this species is scarce in most of Britain it is relatively common in southeast England. In London it is confined principally to woodland ponds such as those at Black Park (08T02), Epsom (16T80) and Esher Common (16T22), Bentley Priory (19T24) and Epping Forest. In her survey, Longfield described it as common and increasing as a breeding species. However, this trend does not seem to have continued and now the species appears to be less common than it was.

BRILLIANT EMERALD *Somatoclora metallica* (Map 20)

Of the species breeding in London *S. metallica* is probably the rarest nationally. In Britain it is restricted to the heaths of Surrey and Sussex and a few localities in northern Scotland. In the London area it occurs at large acid-water ponds which have extensive tree shade. The only London locality for this species mentioned by Longfield was the Basingstoke Canal between Basingstoke and Weybridge, but it has now disappeared from this site. However, it is still present in the L.H.N.S. area and a breeding colony is established on Esher (16T22) and Fairmile (16T02) Common, and it has been reported from Bookham Common (15T26).

FOUR-SPOTTED CHASER *Libellula quadrimaculata* (Map 21)

The four-spotted chaser is common throughout much of Britain and breeds usually in acidic pools and lakes. It is a migrant, so non-breeding individuals are often seen over a wide range of aquatic localities. This probably accounts for its widespread distribution in the London Area since confirmed breeding records are restricted to just a few sites on the Surrey heaths and Epping Forest. Longfield also considered it to be a rare breeding species with southwest London being its stronghold in the capital.

BROAD-BODIED CHASER *Libellula depressa* (Map 22)

This is another common British species although it has a more southerly distribution than *L. quadrimaculata*. Its habitat is less restricted than the preceding species and it will breed in most standing-water localities including garden ponds. The status of *L. depressa* seems to have remained unchanged in the last 40 years.

BLACK-TAILED SKIMMER *Orthetrum cancellatum* (Map 23)

Throughout its range in southern England, *O. cancellatum* seems to be increasing in numbers (Hammond 1983). This trend is also apparent in London, since Longfield lists only a few breeding localities in outer London, although its distribution is still peripheral today. The species may have benefited from the digging of numerous gravel pits, especially in the Colne and Lea Valleys. The males establish their territories on areas of bare soil or gravel, which are plentiful at freshly dug gravel pits, but move on to new localities as the ground becomes colonized by vegetation.

COMMON DARTER *Sympetrum striolatum* (Map 24), Frontispiece.

Of the three *Sympetrum* species which regularly breed in Britain, *S. striolatum* is the commonest and most widespread. It is distributed throughout the British Isles and breeds in most kinds of standing and slow-flowing water bodies. The species is equally common in London and is a frequent breeder in garden ponds.

RUDDY DARTER *Sympetrum sanguineum* (Map 25)

In Britain this species is restricted largely to southeast England where, throughout most of its range, it is thought to be declining due to drainage of its habitats. It breeds in the shallow margins of ponds and lakes which have extensive stands of *Typha* or *Sparganium*. In London *S. sanguineum* is relatively common and will even colonize newly created ponds in inner districts which emphasizes the important role in conservation of such sites. The species was recorded widely in London by Longfield, who thought it was increasing as a breeding species, and it has succeeded in maintaining its position up to the present. However, because of the migratory tendencies of the species the map may present too optimistic a picture since some of the records probably represent individuals on passage.

BLACK DARTER *Sympetrum danae* (Map 26)

This is the last of the species known to be currently breeding within the L.N.H.S. recording area. Although it is common and widespread throughout much of Britain, particularly on heathland, it is rare in the London Area. However, there are strong breeding colonies on Wimbledon (27T20) and Esher (16T22) Commons and it has also been reported from Bookham (15T26) and Mitcham (26T88) Commons. In the 1940s it was known also from Epping Forest, but by 1979 was thought to be extinct (Benton 1988). However, a solitary male was discovered in 1987 (49T28) and it is possible that the species is still maintaining itself in the Forest albeit in low numbers. In addition to these localities, Longfield reported it from the St Albans area, but it now seems to be absent from the Hertfordshire heaths.

Non-breeding Species

In addition to the species discussed above which breed within the L.N.H.S. recording area, there are records of two species for which breeding has not been proven. *Cordulegaster boltonii* is at the eastern edge of its British range in the London Area, but Longfield had a few scattered records of it from throughout the area. However, apart from Wimbledon Common, where because of persistent records she thought it may have been resident, she suspected that it was a wanderer from outside the L.N.H.S. boundaries. I have received a few records of individuals from Epping Forest and the Colne Valley, but none from Wimbledon Common. There is no recent evidence for the presence of a breeding population of the species within the L.N.H.S. area.

Sympetrum flaveolum frequently occurs in Britain as a migrant from continental Europe, but has never established itself as a permanent resident in the British Isles. It appears occasionally in the London Area and during the period of the current survey was discovered once, in 1984, in Epping Forest.

Localities

Having discussed the species that are present within the L.N.H.S. recording area it is desirable to highlight the sites of particular importance to dragonflies. Table 1 lists those sites which have large assemblages of species and/or support species that are rare in the capital. It can be seen that the pools on the heaths and commons of Surrey and Epping Forest are among the most important sites in London since they support the rare acid-loving species. However, also of great importance are the unpolluted rivers, particularly where they have not been canalised or dredged and are bordered by unimproved water meadows. Disused gravel pits are also of significance and, where these have a gently shelving shore and are fringed with extensive reed-beds, they often support a large number of species. Finally, the grazing marshes on the banks of the Thames, where they have not disappeared beneath concrete or tarmac, support a wide range of species including the rare *Lestes dryas*.

Most of these localities are on the outskirts of London, but because of their excellent powers of dispersal many dragonfly species are able to colonise ponds even in inner London. In recent years there has been a growing awareness of the value of natural biotopes in cities for wildlife conservation, education and amenity. This has led to the conservation and creation of many sites suitable for wildlife in built-up areas. Some of these localities have originated as small pockets of derelict land and, in order to improve their potential for wildlife, ponds have often been dug. Where the ponds have been well-stocked with aquatic vegetation and are in an unshaded spot, and especially if they are close to a canal or river which can act as a corridor linking inner London with the surrounding countryside, they have been rapidly colonized by dragonflies. Two such sites are the Alexandra Park Conservation Area (39T00) and Gillespie Park (38T06). Although neither pond is more than six years old, 12 species of dragonflies have been recorded between them including *Lestes sponsa* and *Sympetrum sanguineum*.

Despite these efforts, the threats of destruction or neglect to odonate habitats in the capital have never been greater. With the soaring value of land, large well-known sites and even the smallest patch of waste ground are potentially ripe for development. In recent years there have been development proposals for Rainham Marshes, the New River, Gillespie Park, Camley Street and Osterley Park. Changes in management regimes have threatened Cornmill Stream and the Black Pond on Esher Common. Pollution is also an ever-present threat and the River Roding was subject to a major insecticide spillage, although the odonate population is now gradually recovering (Raven 1987).

Conclusion

Although at first sight London may appear to be an unpromising place to look for dragonflies, because of the wide range of aquatic biotopes still present in the capital, the odonate fauna is actually quite rich. There are 25 species breeding within the L.N.H.S. recording area, representing about 75% of the British fauna. In the last 40 years most of the species have maintained their numbers and some have even increased. However, others appear to have declined (Table 2) and steps must be taken to ensure that these species and the localities in which they occur are conserved. Two species have probably become extinct since Longfield's (1949) survey: *Brachytron pratense* and *Orthetrum coerulescens*. However, they still may be present and intriguingly there is a recent unconfirmed report of the latter species from Aldenham Reservoir. Although this locality would appear to be unsuitable for *coerulescens*, Longfield did know of it from Hertfordshire (probably from one of the heaths near St Albans or Hertford), but she does not specify the precise localities.

I will end this article with a plea since it is evident from Map 1 that there are still large areas of London for which I have received no records. I would therefore urge members to continue sending me their sightings (I have plenty of recording cards available on request), particularly from the under-recorded areas, since if we are to conserve dragonflies in London it is vital that we have as complete a picture of their distribution as possible.

Acknowledgements

I am very grateful to everyone who has sent me their dragonfly sightings over the last six years, unfortunately space does not permit me to thank them all by name. However, I am particularly indebted to Dr Ted Benton (Essex), the Rev. Tom Gladwin (Herts) and Mr Harry Eve (Kent) for access to the Odonata records that they have compiled for county surveys.

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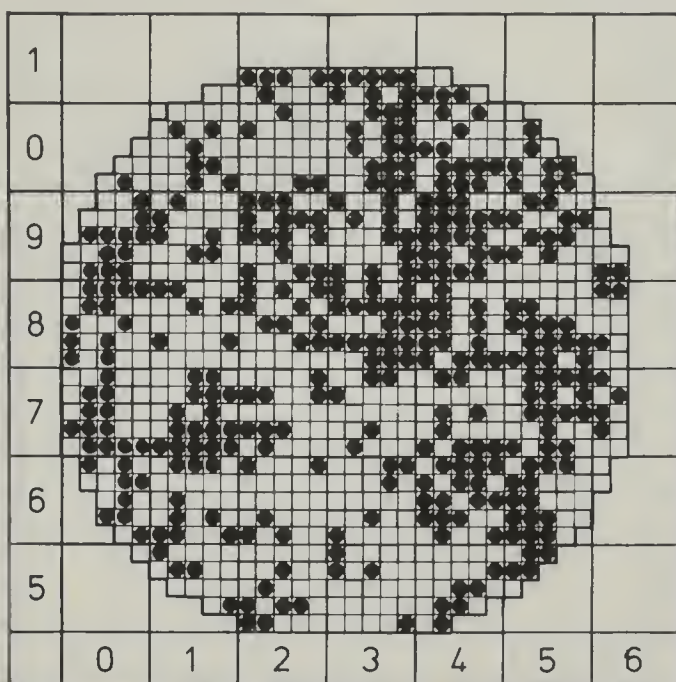
TABLE 1. Localities within a 20-mile radius of St Paul's Cathedral with large assemblages of odonate species or locally rare species (from records received 1983-1988).

Site	No. species	Notable species
Cornmill Stream (30T80)	18	<i>P. pennipes</i> , <i>E. najas</i> , <i>C. pulchellum</i> , <i>C. virgo</i> , <i>L. quadrimaculata</i>
Esher Black Pond (16T22)	18	<i>C. tenellum</i> , <i>C. aenea</i> , <i>S. danae</i> , <i>S. metallica</i> , <i>A. juncea</i> , <i>L. quadrimaculata</i>
Wake Valley Ponds (49T28)	18	<i>C. aenea</i> , <i>S. danae</i> , <i>E. najas</i> , <i>L. quadrimaculata</i>
Bookham Common (15T26)	17	<i>S. danae</i> , <i>C. virgo</i> , <i>S. metallica</i> , <i>L. quadrimaculata</i>

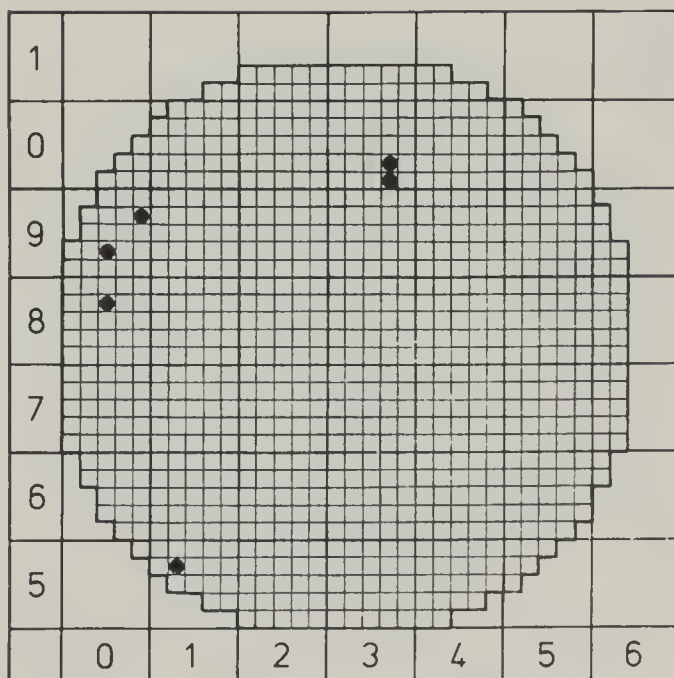
Amwell Quarry (31T62)	16	<i>P. pennipes</i> , <i>E. najas</i> , <i>L. quadrimaculata</i>
Roding Valley (49T44-50T60)	15	<i>P. pennipes</i> , <i>C. aenea</i>
Epsom Stew Ponds (16T80)	14	<i>C. aenea</i> , <i>E. najas</i>
Langham Pond Runnymede (07T02)	14	<i>C. pulchellum</i> , <i>E. najas</i>
Aldenham Reservoir (19T64)	12	<i>E. najas</i>
Black Park (08T02)	12	<i>C. aenea</i> , <i>E. najas</i> , <i>L. quadrimaculata</i>
Sevenoaks Wildfowl Res. (55T06)	12	<i>C. aenea</i> , <i>E. najas</i>
Wimbledon Common (27T20-27T22)	12	<i>S. danae</i> , <i>A. juncea</i>
Keston Ponds (46T04)	11	<i>E. najas</i> , <i>L. quadrimaculata</i>
Rainham Marshes (57T28-57T48)	8	<i>L. dryas</i>

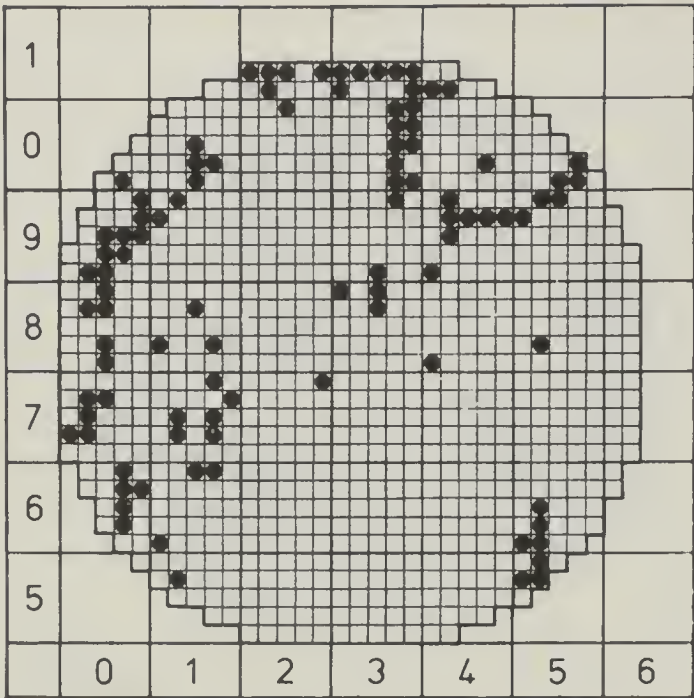
TABLE 2. Checklist of Odonata species recorded within a 20-mile radius of St Paul's Cathedral since 1949.

	1988 status	Current distribution relative to 1949
<i>Calopteryx virgo</i>	breeding	declined
<i>C. splendens</i>	breeding	unchanged
<i>Lestes sponsa</i>	breeding	increased
<i>L. dryas</i>	breeding	unchanged
<i>Platynemesis pennipes</i>	breeding	declined
<i>Pyrrosoma nymphula</i>	breeding	declined
<i>Erythronema najas</i>	breeding	declined
<i>Coenagrion puella</i>	breeding	unchanged
<i>C. pulchellum</i>	breeding	unchanged
<i>Enallagma cyathigerum</i>	breeding	unchanged
<i>Ichnura elegans</i>	breeding	unchanged
<i>Ceragrion tenellum</i>	breeding	slight decline
<i>Brachytron pratense</i>	extinct	declined
<i>Aeshna juncea</i>	breeding	unchanged
<i>A. mixta</i>	breeding	increased
<i>A. cyanea</i>	breeding	unchanged
<i>A. grandis</i>	breeding	slight increase
<i>Anax imperator</i>	breeding	unchanged
<i>Cordulegaster boltonii</i>	non-breeding	unchanged
<i>Cordulia aenea</i>	breeding	declined
<i>Somatochlora metallica</i>	breeding	slight increase
<i>Libellula depressa</i>	breeding	unchanged
<i>L. quadrimaculata</i>	breeding	unchanged
<i>Orthetrum cancellatum</i>	breeding	increased
<i>O. coerulescens</i>	?extinct	declined
<i>Sympetrum striolatum</i>	breeding	unchanged
<i>S. sanguineum</i>	breeding	unchanged
<i>S. danae</i>	breeding	slight decline
<i>S. flaveolum</i>	non-breeding	unchanged

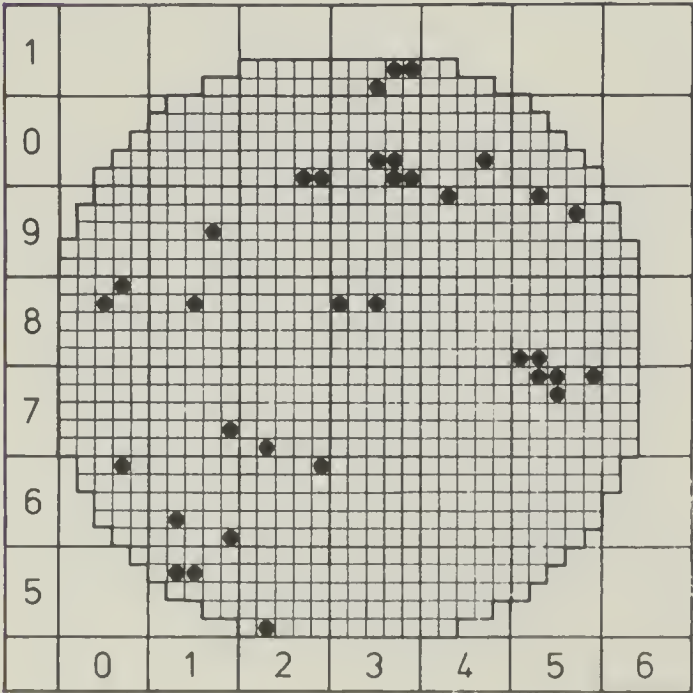


MAP 1. All records, 1983-88.

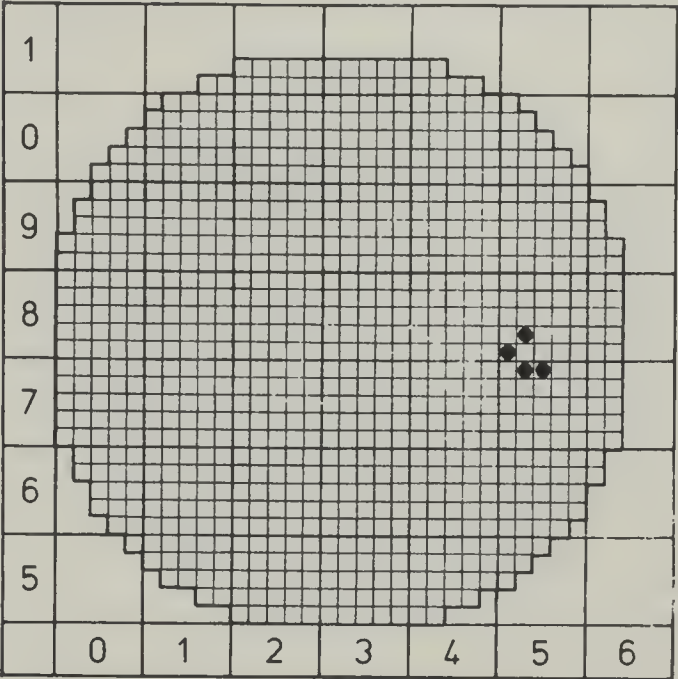
MAP 2. BEAUTIFUL DEMOISELLE *Calopteryx virgo*. Recorded distribution, 1983-88.



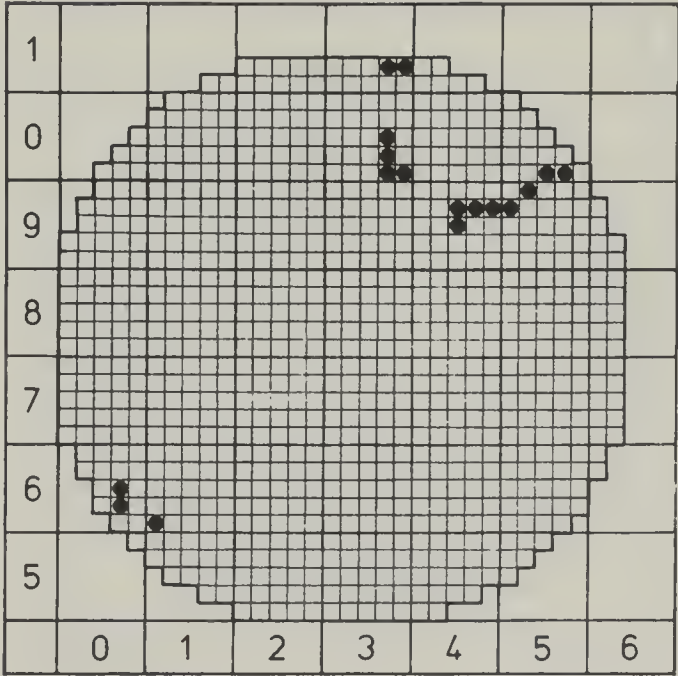
MAP 3. BANDED DEMOISELLE *Calopteryx splendens*. Recorded distribution, 1983-88.



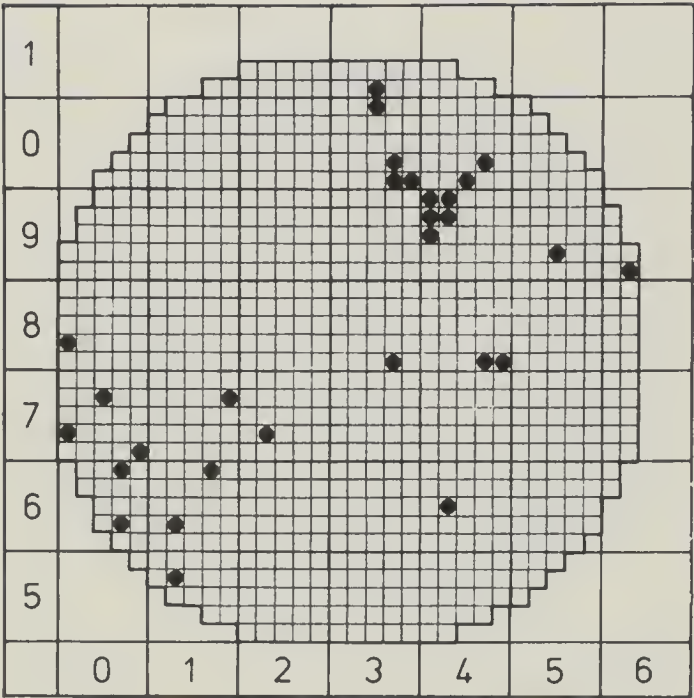
MAP 4. EMERALD DAMSELFLY *Lestes sponsa*. Recorded distribution, 1983-88.



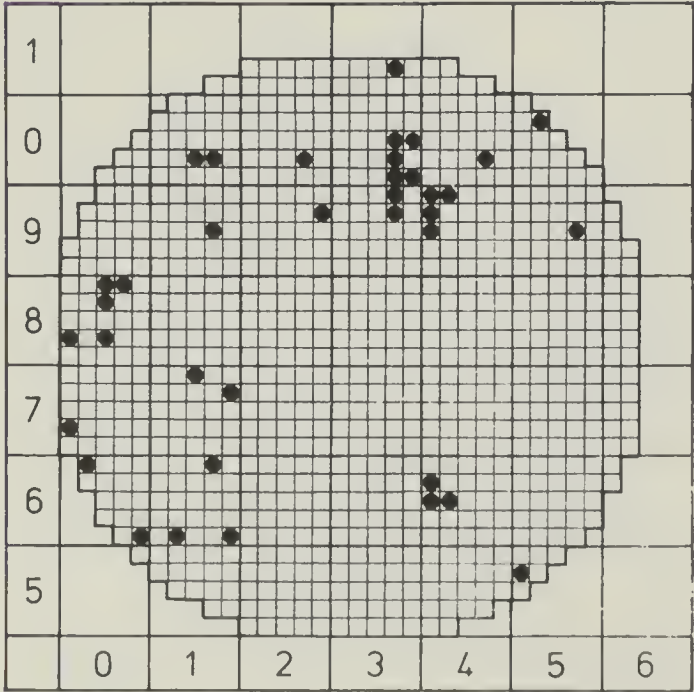
MAP 5. SCARCE EMERALD DAMSELFLY *Lestes dryas*. Recorded distribution, 1983-88.



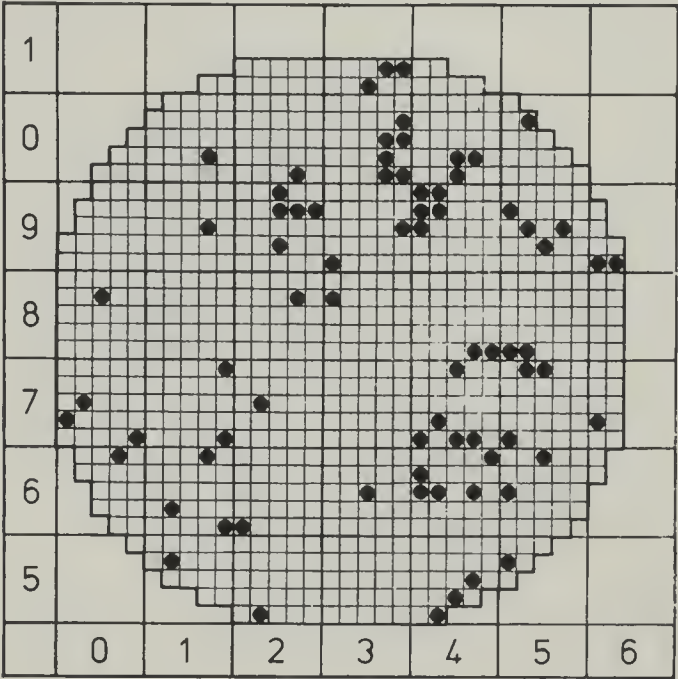
MAP 6. WHITE-LEGGED DAMSELFLY *Platynemesis pennipes*. Recorded distribution, 1983-88.



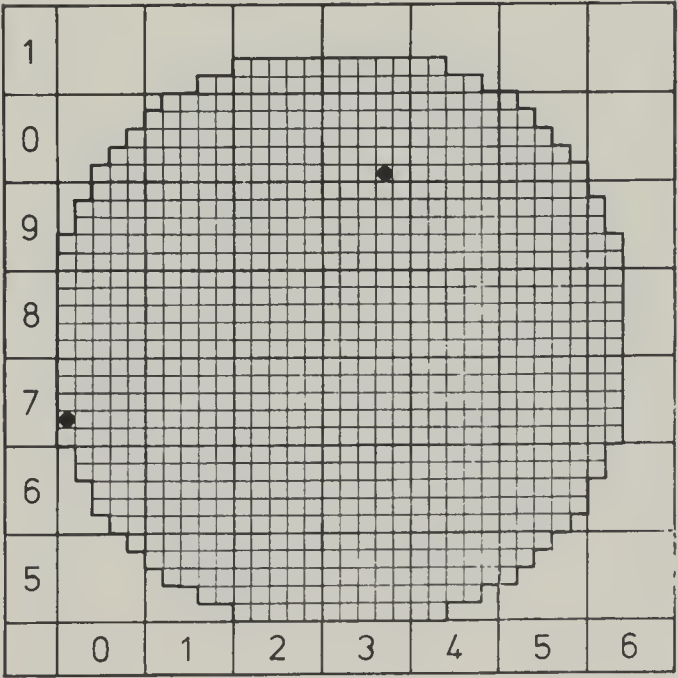
MAP 7. LARGE RED DAMSELFLY *Pyrrhosoma nymphula*. Recorded distribution, 1983-88.



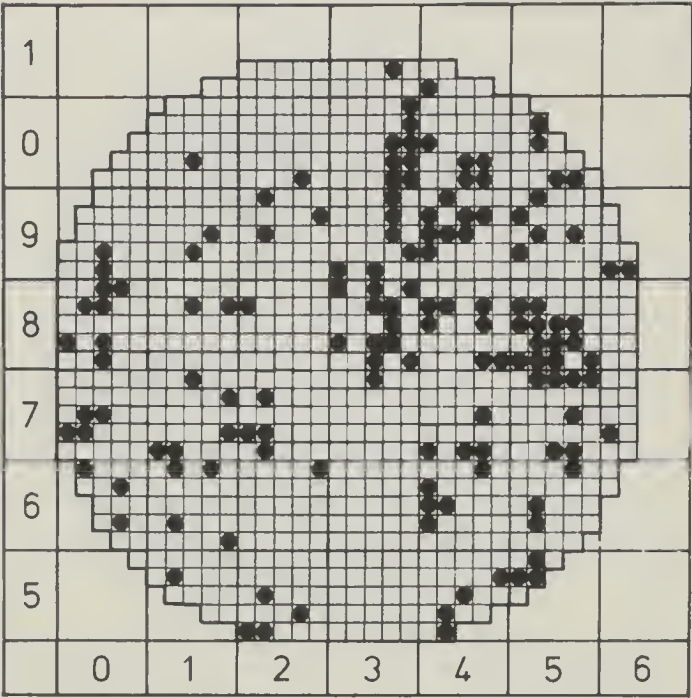
MAP 8. RED-EYED DAMSELFLY *Erythronuma najas*. Recorded distribution, 1983-88.



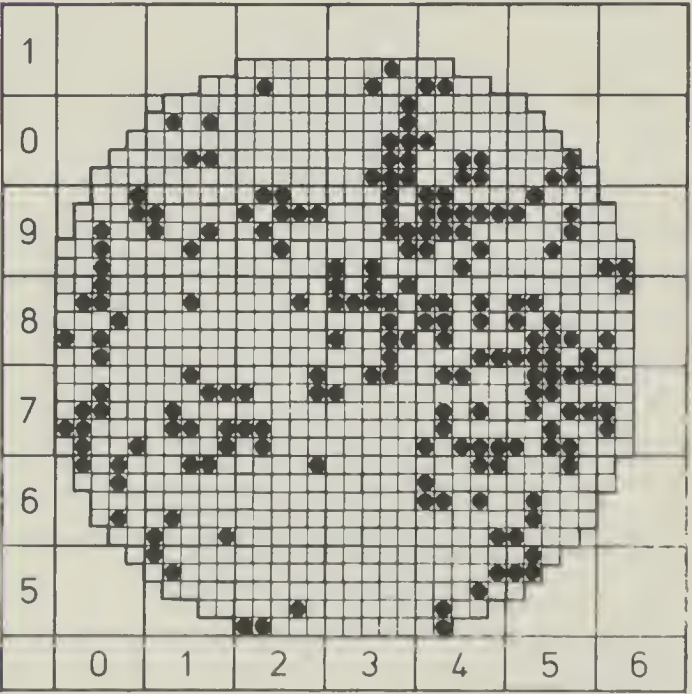
MAP 9. AZURE DAMSELFLY *Coenagrion puella*. Recorded distribution, 1983-88.



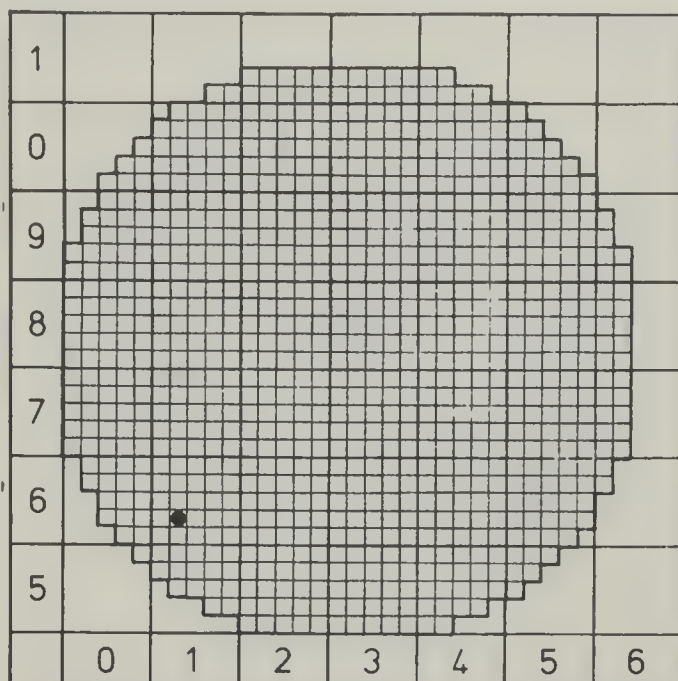
MAP 10. VARIABLE DAMSELFLY *Coenagrion pulchellum*. Recorded distribution, 1983-88.



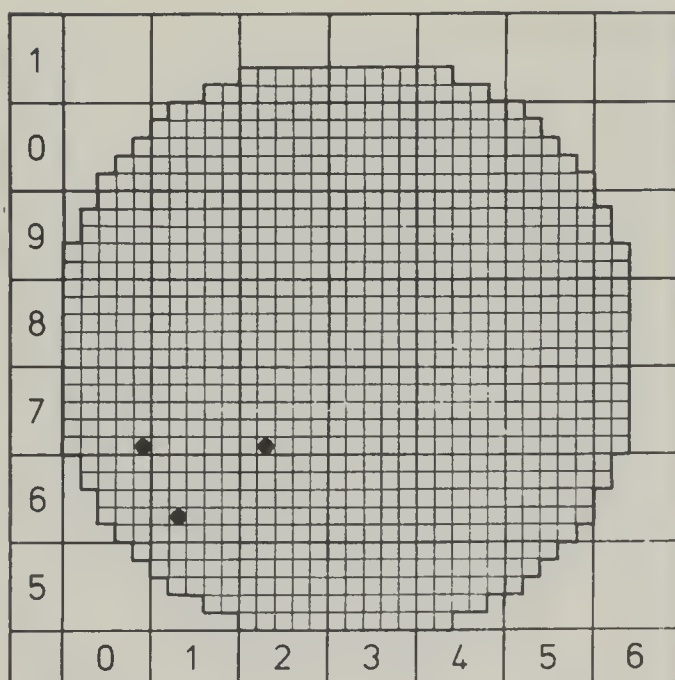
MAP 11. COMMON BLUE DAMSELFLY *Enallagma cyathigerum*. Recorded distribution, 1983-88.



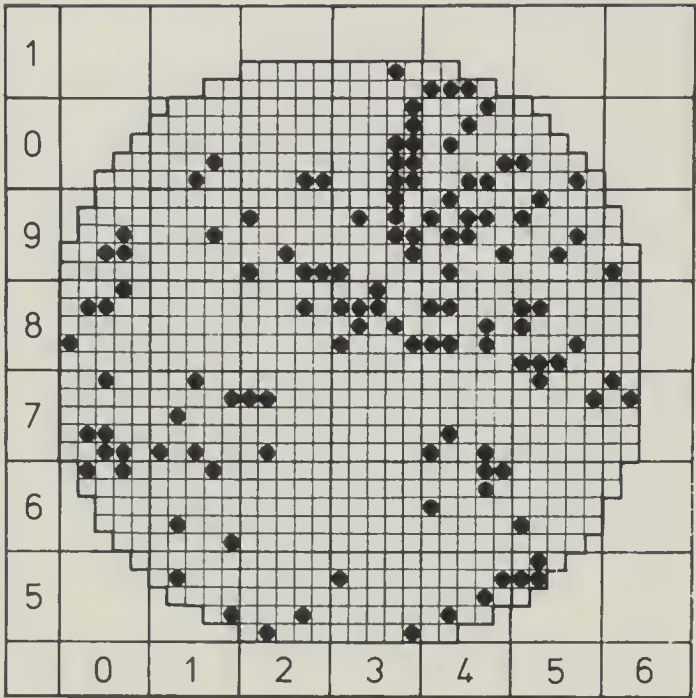
MAP 12. BLUE-TAILED DAMSELFLY *Ischnura elegans*. Recorded distribution, 1983-88.



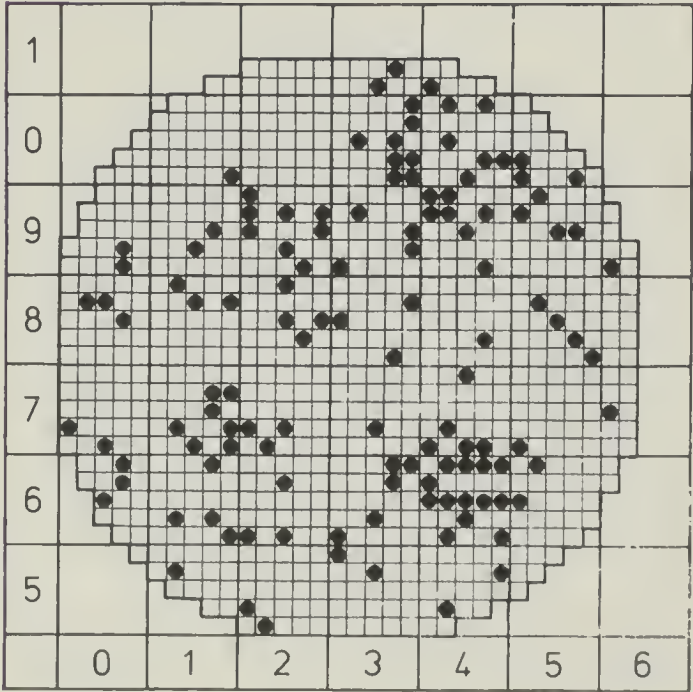
MAP 13. SMALL RED DAMSELFLY *Ceriagrion tenellum*. Recorded distribution, 1983-88.



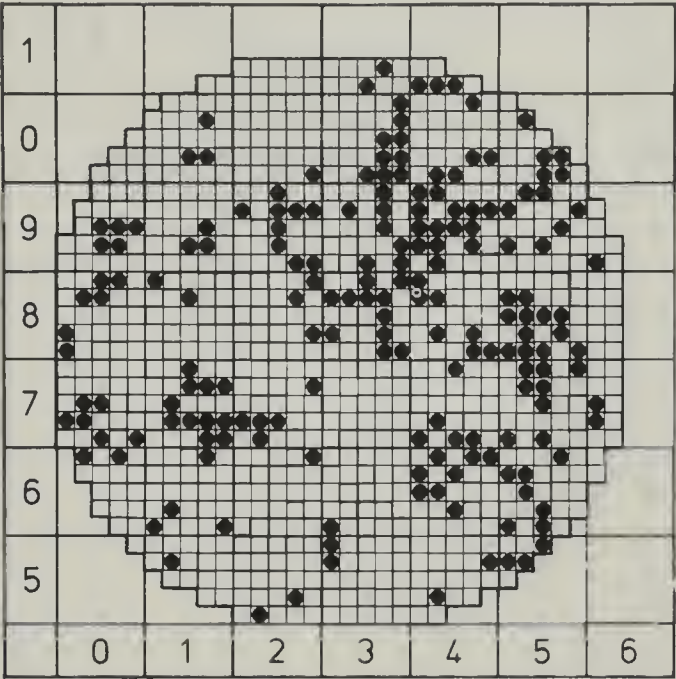
MAP 14. COMMON HAWKER *Aeshna juncea*. Recorded distribution, 1983-88.



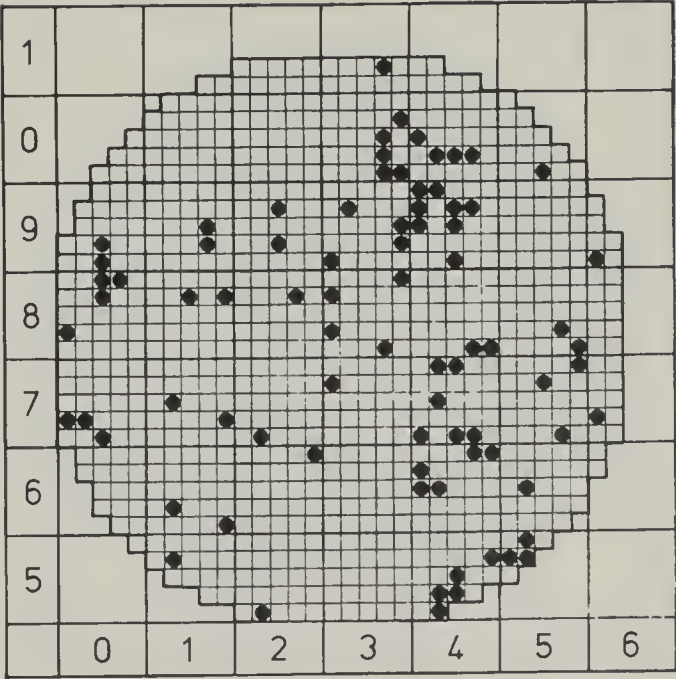
MAP 15. MIGRANT HAWKER *Aeshna mixta*. Recorded distribution, 1983-88.



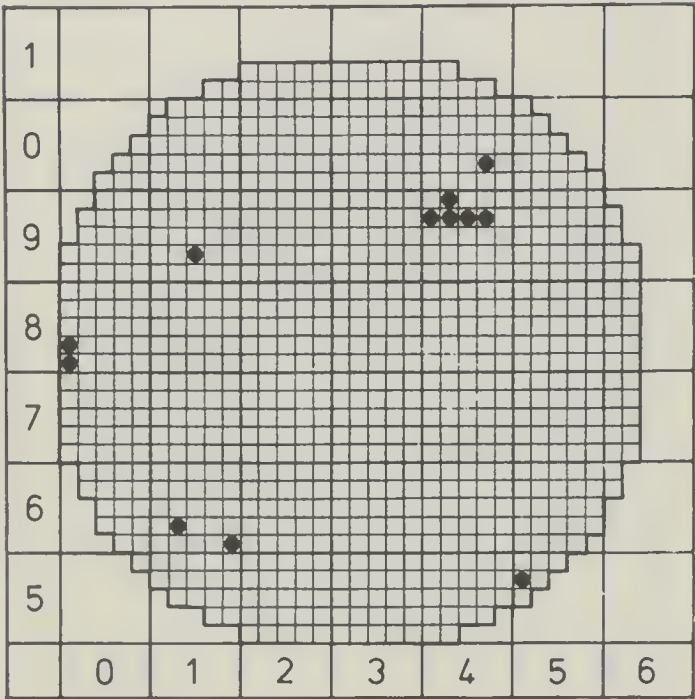
MAP 16. SOUTHERN HAWKER *Aeshna cyanea*. Recorded distribution, 1983-88.



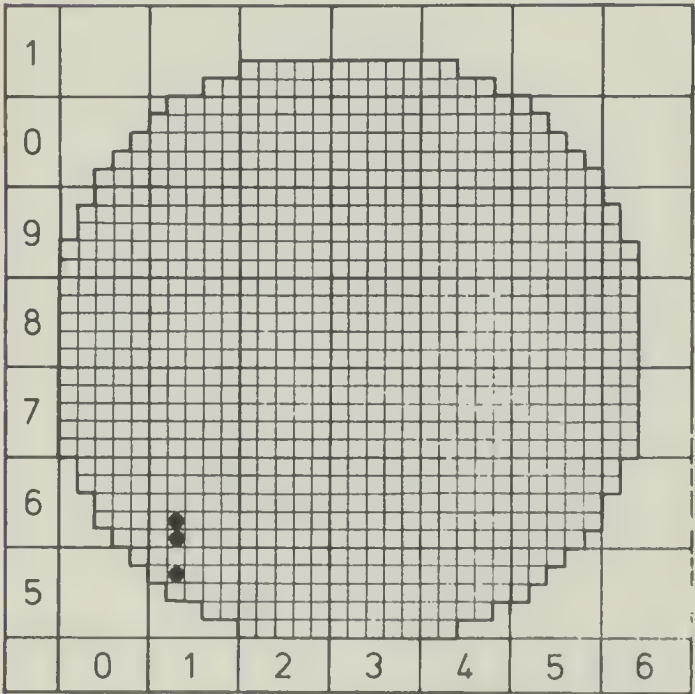
MAP 17. BROWN HAWKER *Aeshna grandis*. Recorded distribution, 1983-88.



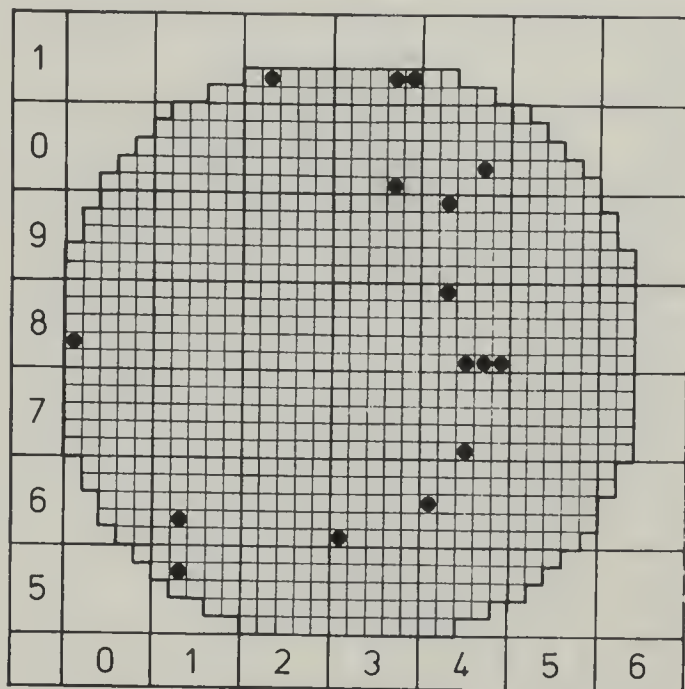
MAP 18. EMPEROR DRAGONFLY *Anax imperator*. Recorded distribution, 1983-88.



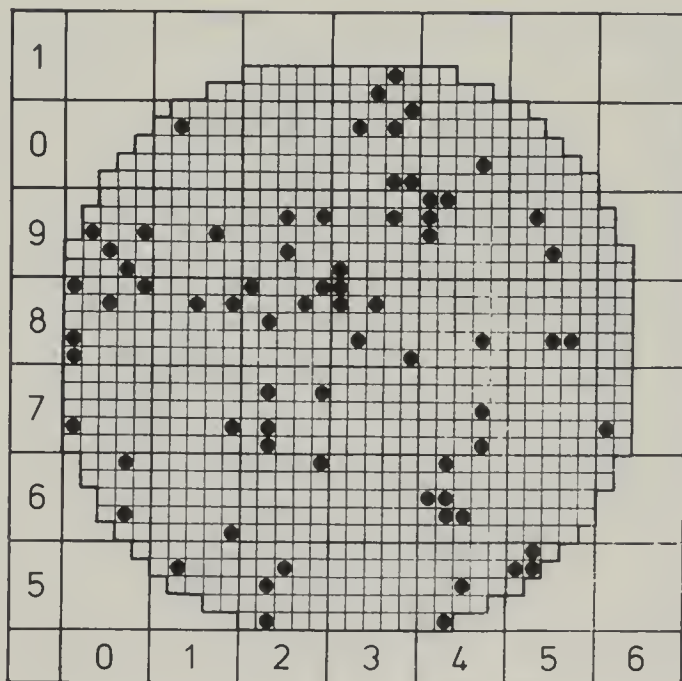
MAP 19. DOWNY EMERALD *Cordulia aenea*. Recorded distribution, 1983-88.



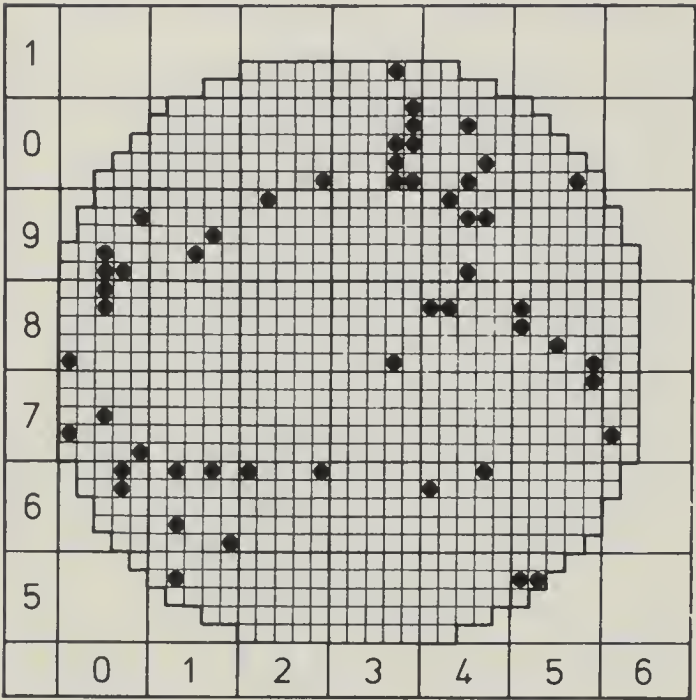
MAP 20. BRILLIANT EMERALD *Somatochlora metallica*. Recorded distribution, 1983-88.



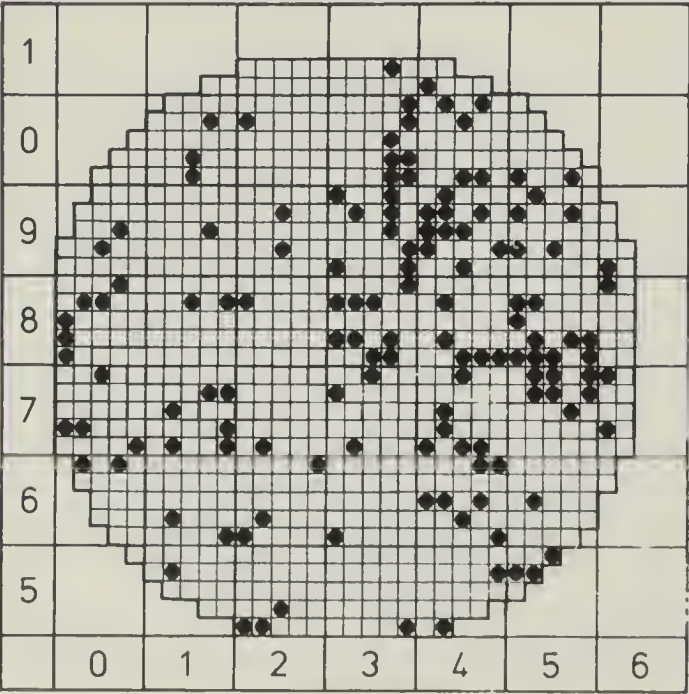
MAP 21. FOUR-SPOTTED CHASER *Libellula quadrimaculata*. Recorded distribution, 1983-88.



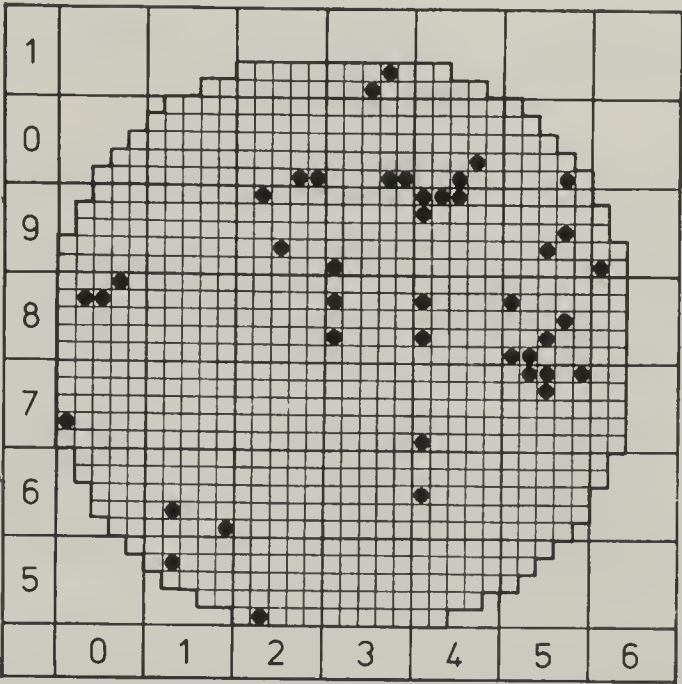
MAP 22. BROAD-BODIED CHASER *Libellula depressa*. Recorded distribution, 1983-88.



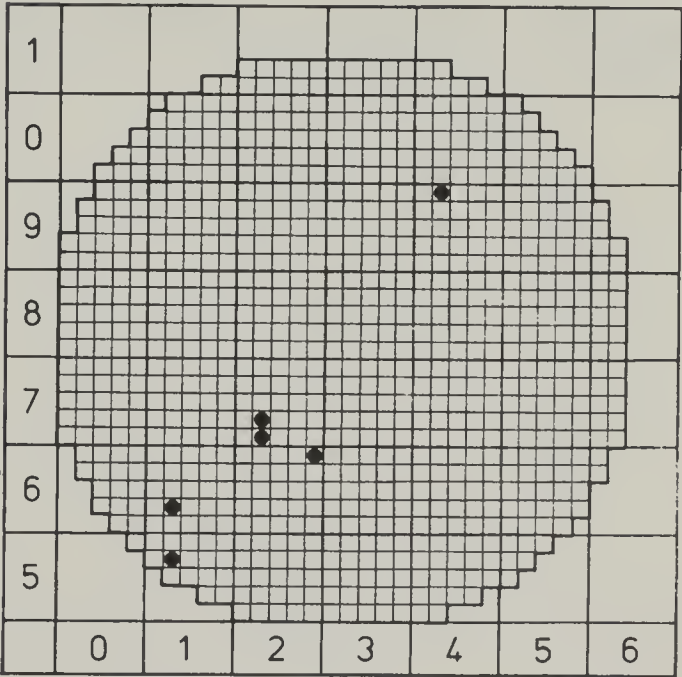
MAP 23. BLACK-TAILED SKIMMER *Orthetrum cancellatum*. Recorded distribution, 1983-88.



MAP 24. COMMON DARTER *Sympetrum striolatum*. Recorded distribution, 1983-88.



MAP 25. RUDDY DARTER *Sympetrum sanguineum*. Recorded distribution, 1983-88.



MAP 26. BLACK DARTER *Sympetrum danae*. Recorded distribution, 1983-88.

Book Review

Snakes and Lizards. By Tom Langton. Illustrations by Denys Ovenden. Whittet Books, London, 1989. 128 pp. 80 line illustrations. £6.95. ISBN 0 905483 77 4.

The Reptilia are a much mis-understood and frequently maligned group of animals. As the author of this new book himself observes 'When the Devil, disguised as a serpent, tempted Eve with a heavenly apple, it was a bad press-day for reptiles. A flick through the Bible confirms the long-standing public profile of snakes as untrustworthy and evil'. It is this reviewer's contention that this religious root is the main cause of all the fear, prejudice and nonsense that even today belies the true nature of these fascinating creatures.

Now, apparently for the first time, there is a compact, yet comprehensive book, at an affordable price, which sets the record straight. The work distinguishes itself in its accuracy and its 'no holds barred' approach in attacking all of the available myths and legends with a series of factual scientific punches. In between these record-straightening sections, which are dotted throughout the book, is a great deal of additional true information on the British snakes and lizards which combine to make this probably the best general-readership book available on this subject.

The book is well laid out and easy to read. It is possible to dive in at any point in the text and pick up much useful information – without any need to read the 'chapters' in order. Where it has been necessary to employ technical language in the text this is fully and simply explained, obviating the need for a glossary – a feature so often included, but seldom really needed in many natural history books today.

The overall comprehension of the text is enhanced by the often amusing and always brilliantly executed illustrations by Denys Ovenden – even down to the little lizard which encircles every page number!

Tom Langton is known to most of us, of course, for his sterling activities as the London Natural History Society's Recorder for amphibians and reptiles, whilst he is also widely acclaimed for his efforts in the herpetological field over a wider area. It is to be hoped that this will be the first of many contributions from him to the literature in this subject area.

If I was asked to recommend a single general readership natural history book under £10 for 1989 this would be the one. It is suitable for anyone aged 9 to 90.

COLIN W. PLANT

Survey of Bookham Common

FORTY-SEVENTH YEAR

Progress Report for 1988

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General (Geoffrey Beven)*

Oliver B. J. French died suddenly on 17 August 1988. This was a great loss to the Survey. He was a courteous, cheerful and enthusiastic member, willing to take on surveys to increase the knowledge of the natural history of the Common. In 1976-77 he made a survey of the rabbit population (French 1980) to note the changes since the 1967-70 survey of Towns (1972). Then he began studying the mosses and since 1983 he has reported annually on them. With R. C. Stern he summarised the recent records for the Common (Stern and French 1983). A naturalist of wide interests, he also contributed many observations on birds and vascular plants. He will be greatly missed. His obituary appeared in last year's *London Naturalist*.

Dorothy Rook died in July 1988. She had been librarian to the R.S.P.B. for over ten years and in 1977 was awarded their Jubilee Medal for her services. She retired in 1978. Previously she had been an active member of the Survey team, assisting with the bird census work in the 1950s.

Ella Hillman is not now well enough to continue with field observations. Since 1948 she has been taking a leading part in many aspects of field work and gave much help in organising the Survey.

We are grateful to Brad Ashby for cleaning and making minor repairs to the binocular microscope.

More members are required to help with the Survey. It has been going since 1941, but by no means does this indicate there is nothing to do. Firstly, although some aspects have been relatively well worked, others, such as the microscopic waterlife, nematodes, stoneflies, grasshoppers and bats, have not been completely listed, and few serious studies have been done. Secondly, lists of some species were made in the early years of the Survey and now need rechecking to see what changes have occurred, for example beetles and bugs. Some of the species of butterflies have disappeared, but the present status of all species is reviewed by Alan Wheeler on page 143. The list of moths is still increasing. New species of animals and plants still occur. Thirdly, the environment is changing. The Common was grazed by cows, horses, geese and sheep until 1949. Natural succession towards climax oakwood then took over, despite efforts by the Keeper to keep things static by conservation management. Shrubs and woods are spreading, although some trees were blown down by the

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gale in October 1987. It will be interesting to investigate the habitats to see what further changes occur.

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Management Tasks on Bookham Common 1988 (Ian F. Swinney*, National Trust Warden)

Much of the work undertaken on the Bookham Commons is tied to the overall presentation of the property. Rotational cutting of the paths and grassland areas, litter collection, signs, barriers and car park maintenance are necessary on-going tasks. However, due to the assistance of many volunteers we have been able to tackle some important projects which will help to maintain the diversity of wildlife.

Though some of the storm-damaged trees and branches have still to be cleared from the tracks, the majority will remain as an important dead-wood habitat. The storm has created useful gaps in the otherwise uniform canopy of some woodland areas, leading to a desirable diversity of structure.

Early in the year some willow saplings were transplanted near High Point. This has been initiated to ensure the continuity of larval food-plants for the purple emperor butterfly *Apatura iris* which lays its eggs on the goat willow *Salix caprea* and sallow *S. cinerea*. Wherever possible the honeysuckle *Lonicera periclymenum* is left for the white admiral *Ladoga camilla*.

Clearing has continued of some of the mature scrub on Bayfield and Western Plains. This is an attempt to slow the advance of the oak woodland and provide variation in the age (and therefore the height and density) of the scrub areas. One problem that has arisen is the appetite of the roe deer *Capriolus capriolus* for rose family scrub, which is readily eaten, leaving birch and willow to grow. This 'thornless' scrub does not provide such dense cover for birds.

This year we have been able to improve the surroundings of some of the ponds. At Sheepbell Pond a number of trees were felled on the south side, allowing far more light to reach the pond margins. This should increase the emergent plants and be of value to the large red damselfly *Pyrhosoma nymphula*. Though not particularly rare, this is the only pond on the Commons where it occurs. Similar operations at South-east, Crater and Bayfield Ponds should also aid the aquatic flora and fauna. At Sheepbell Pond a large amount of the build-up of leaf litter was removed after consultation with Ruth Day, who has made a study of freshwater invertebrates in some of the outlying ponds.

The oaks on the south-east side of Isle of Wight Pond were thinned this year. On 16 October 12 Common Carp *Cyprinus carpio* and 60 kilograms of silver bream *Blicca bjoerkna* were removed by Thames Water Authority. It is hoped that the reduction in the fish population will reduce the turbidity of the water and encourage the spread of floating and emergent vegetation.

Further clearing of the trees and scrub to the north-east of Isle of Wight Path North, sq. 46, should favour conditions for the re-emergence of cross-leaved heath *Erica tetralix*.

Some of the crack willow *Salix fragilis* had to be pollarded this year, as they were declared unsafe. From some of the Society's old photographs it appears that this is traditional with crack willow on the Commons.

James Parker, currently at Sheffield Polytechnic, has begun a study of the grassland on Central Plain. The comparison between rank grasses and an area that is rabbit-grazed should be very interesting, especially as a full soil analysis is being undertaken. This work will provide a useful beginning for the

*Merritt's Cottage, Great Bookham Common, Leatherhead, Surrey.

monitoring that will be necessary if we are to re-introduce seasonal cattle-grazing to this part of the Commons. Outline plans are already being considered by the National Trust in consultation with the Nature Conservancy Council, Department of the Environment and the London Natural History Society.

We will require a great deal of assistance with this and other projects, so please support us if you can. On behalf of the National Trust Bookham Commons Committee, I would like to thank the Society's Survey team for their great contribution to this area of common land, for making it one of the best-recorded sites in the country and for helping us to enjoy and understand its wildlife – long may it continue.

Vegetation: Changes in the Fern Populations (Ken Page*)

In recent years the Survey team has increased considerably its recordings of fern species. This is due, in part, to searching for these plants in autumn and early winter. At this time of year leaf fall has occurred and much herbaceous growth has died back to ground level making the persistent green fern fronds a conspicuous feature of the winter vegetation. The notable exception is the ubiquitous bracken *Pteridium aquilinum* which turns russet-brown, but nonetheless provides a backcloth for the fern species that remain green.

A rare and interesting fern for Bookham Common is the scaly male fern *Dryopteris affinis*. The first plant was discovered in 1979; there are now two plants in division A and two in M. It is readily recognised by the abundance of brown scales throughout the entire length of the petiole and rachis. It is also variable and three subspecies are recognised in the British Isles – the Bookham plants belonging to subspecies *borreri*.

The narrow buckler fern *Dryopteris carthusiana* appears to have been confused with the more plentiful broad buckler fern *D. dilatata* in the past. The narrow buckler fern is generally less robust than the broad buckler fern, and has pale, yellowish-green fronds and concolorous scales sparsely distributed, mainly on the lower part of the petiole (Jones 1954). There were a few doubtful records in 1953 but it is now widespread in the area, being absent only from divisions J, R and T.

The elegant lady fern *Athyrium filix-femina* is rare here. Known solely from division K for many years, it has now been observed in A, C, G, H and R.

Doubtfully wild on the Common is the soft shield fern *Polystichum setiferum*. Plants occur near habitations in divisions C, D, N and R, and in all cases may be relics of cultivation. However, in N, natural regeneration has produced three young plants.

Male fern *Dryopteris filix-mas* and broad buckler fern *D. dilatata* have remained constant and occur in every division. Adder's tongue fern *Ophioglossum vulgatum* recorded in P, Q, R and S (Jones 1954) is still found only in those divisions. Hartstongue fern *Phyllitis scolopendrium*, found first in 1978 in divisions A and N (Radcliffe and Page 1981), now survives only in N.

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Fungi (Pamela Goldsmith†)

The following species, new to Bookham Common, were found in 1988.
 i. 9 October on Bayfield Plain.

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Agaricales

Cortinarius purpurascens
Inocybe eutheles
Melanoleuca melaleuca

Russula betularum
Tricholoma ustaloides
Tubaria conspersa

Aphyllophorales

Lachnella villosa (on *Urtica*)
Pellidiscus pallidus (on rotten wood)

Gasteromycetes

Scleroderma areolatum

Ascomycetes

Ciboria batschiana
Lophiostoma semiliberum (on *Urtica*)
 Checked by Dr B. Spooner.

ii. 13 November in Central Wood.

Aphyllophorales

Hyphodontia nespori (*Grandinia nespori*)
 Checked by Dr D. Reid.

Aquatic Invertebrates (John W. Coles*)

In 1988 the following species were found by me unless otherwise stated.

Protozoa

Stentor sp. and *Paramecium* sp. were found in Western Hollows Pond, and *Carchesium* sp. was found in Eastern Hollows Pond on 23 October.

Coelenterata

Hydra oligactis was found by C. B. Ashby and *Hydra vulgaris* by J. W. Coles in Western Hollows Pond on 23 October.

Rotifera

Floscularia ringens, *Aneuropsis fissa* and *Conochilus* sp. were found in the ponds on 21 May by Anthony Saunders-Davies of the Quekett Microscopical Club, apparently new records for the Common, and also *Stephanoceros fimbriatus* was found in Eastern Hollows Pond by J. W. Coles on 23 October, this also appears to be a new record for the Common.

Crustacea, Malacostraca: Amphipoda

Crangonyx pseudogracilis Bousfield, (identified by M. H. Thurston) was found in Western Hollows Pond on 23 October.

On 8 May a crayfish *Astacus pallipes*, three inches long, was found dead and partly eaten by shrimps, in Bookham Stream, north of Hundred Pound Bridge sq. 18 (per A.P.).

Insecta, Diptera

Chaoborus sp. was found in Lower Eastern Pond on 23 October.

Birds (Geoffrey Beven)*Population Studies*

Andrew Merritt made six visits between March and June 1988 to the 16-hectares of dense pedunculate oakwood (Eastern Wood). In 1983, 1984, 1987

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and 1988 wren *Troglodytes troglodytes* territories were 21, 27, 21 and 24, blackbird *Turdus merula* 13, 12, 10 and 12, and robin *Erithacus rubecula* 26, 26, 29 and 31. Thus, these three species all show a slight increase but there is very little change. The number of great tits *Parus major* has decreased, the figures for the same years being 11, 13, 19 and 12, and the number of blue tits *P. coeruleus* increased slightly, the corresponding figures being 21, 23, 23 and 25.

No census was made in the 39-hectares of scrub and grassland during 1988.

Birds in 1988

A pair of grey herons *Ardea cinerea* nested in Eastern Wood 612 and on 30 May 1-2 young were seen in the nest (A.M.). On 7 February a mandarin duck *Aix galericulata* was seen near Hollows Pond and on 23 March a pair flew NE over Stents Wood (A.M.). One blue phase snow goose *Anser coerulescens* flew W over Western Plain with four Canada geese *Branta canadensis* on 11 September. There were three nightingales *Luscinia megarhynchos* singing on the plains 452, 486-489, 875, during April-May (I.S.).

Fringillidae

Chaffinches *Fringilla coelebs* enter the woodlands in March-April and largely leave in July (Beven 1956). The situation is very similar in the shrublands on the plains but, on adjacent farmlands the numbers increase in autumn, where they collect on fields of newly cut hay. In winter these birds form larger flocks feeding in the stubble fields and about stackyards. The flocks disperse in March.

The numbers of territories of singing male chaffinches in Eastern Wood, 16ha(40ac), a pedunculate oakwood, from 1949 to 1988 were as follows:— '49 9.5, '50 11, '51 12.5, '52 9.5, '53 9, '54 8, '55 8, '56 6, '57 —, '58 4.5, '59 2, '60 2.5, '61 4.5, '62 7, '63 5.5, '64 7, '65 8, '66 7, '67 6, '68 4, '69 4, '70 3, '71 6, '72 8, '73 3, '74 1, '75 3, '76 3, '77 3, '78 3, '79 2, '80 3, '81 4, '82 1, '83 3, '84 4, '85 —, '86 —, '87 4, '88 4 (G.B., L.M., A.M.). There were no counts in 1957, '85 and '86. The population was high in 1951 and has waxed and waned three or four times in the last 35 years i.e. in 1951, 1965, 1972 and perhaps 1981. Nevertheless, the B.T.O. found that 'the chaffinch is one of the most stable woodland species monitored since 1964' (Marchant and Whittington 1988).

On Western, Isle of Wight and Bayfield Plains, 24ha(61ac), a grassland with much scrub and trees, in some years between 1948 and 1963, the numbers of territories of singing male chaffinches were as follows:— '48 12, '49 17, '54 12, '55 9, '56 10, '57 6, '58 9, '59 8, '62 12, '63 9 (P.W.E.C., W.D.M.). From 1964 to 1985 Central Plain, a similar area with grasses, scrub and trees, was included in the census area, making a total of 39ha(96ac) of the Plains, the number of territories being as follows:— '64 18, '65 13, '66 13, '67 14, '68 9, '69 12, '70 17, '71 11, '72 14, '73 14, '74 15, '75 14, '76 10, '77 15, '78 16, '79 16, '80 18, '81 12, '82 12, '83 8, '84 8, '85 8 (G.B., D.A.B., W.D.M.). This suggests peaks in population in 1949, 1964, 1970 and 1980. Curiously, these preceded the woodland peaks by 1-2 years each time.

The only records of bramblings *F. montifringilla* seem to be: 12 February 1956, one feeding with chaffinches in Chesmore farmyard, just NW of the Common, and on 11 December 1960 one called as it flew over Western Scrub 423.

On 6 June 1943 a greenfinch *Carduelis chloris* was 'jeezing' by the Isle of Wight Pond 576, in July 1947 a pair was in song flight at the western edge of Central Plain 875, in June 1948 a pair reared young in Station Copse and also near the Clump 819 in September 1949 (G.B., P.W.E.C., A.R.W.). In spite of these records it was stated that greenfinches 'were probably not resident on the Common' (Carrington *et al.* 1944, Beven 1964). However, it was noticed that between one and 11 birds were present during the summer on Western-Bayfield Plains during 1954-59 (Melluish 1960) and, certainly by 1965 territories were

noted on the plains. By then more of the shrubs e.g. hawthorn, had grown large enough to give cover for nests. On 39ha(96ac) including Western, Isle of Wight, Bayfield and Central Plains, the number of territories of singing males was:- '65 1, '66 2, '67 4, '68 1, '69 1, '70 4, '71 6, '72 4, '73 4, '74 2, '75 3, '76 1, '77 3, '78 0, '79 0, '80 0, '81 0, '82 0, '83 0, '84 0, '85 0 (D.A.B., W.D.M.). The decrease in greenfinches since 1978 is very striking and in the country as a whole they are still decreasing (Marchant and Whittington 1988). This may be due to agricultural practices, notably the increasing use of herbicides on nearby farmland.

Greenfinches occasionally breed on the edge of woods, and in Eastern Wood 16ha(40ac), where a census has been done since 1949, a greenfinch territory has occurred in 1966, 1972 and 1979 (G.B., L.M., A.M.). Several were often seen on the plains in winter, but in 1964-65 between one and six parties, each totalling between 20 and 36 birds, were noted over the plains just before roosting time and in 1967-68 on various dates, between eight and 58 settled on hawthorn to roost (G.B.), while in 1969 about six flocks of 20 or so flew over (C.H.). They were most often seen splitting rose hips and eating the seeds, then wiping their bills on hawthorn twigs. Three were seen taking the fruits from burdock *Arctium lappa*. There were also nine records of birds taking seeds from burnt ground in 1959 (G.B.).

The siskin *Carduelis spinus* is a winter visitor in small numbers, but probably it is frequently overlooked. It may be seen between November and April, often feeding on birch cones with redpolls *Acanthis flammea*, but sometimes on the ground among the leaf-litter. Siskins are usually in small numbers (one to five) but occasionally in a flock of 15-20 birds.

Goldfinches *Carduelis carduelis* probably bred on the western edge of the Common e.g. at 489, 768, 847, 875, 884 and on the Isle of Wight in 1943, '47, '49, '50 and '68 (G.B., P.W.E.C., P.J.S., A.R.W.). Otherwise until 1966 they were regarded as visitors to the plains to feed in late summer and winter, chiefly taking the seeds of thistle, especially marsh thistle *Cirsium palustre*, fruits of teasel *Dipsacus fullorum*, hairy willowherb *Epilobium hirsutum*, hoary ragwort *Senecio erucifolius*, knapweed *Centaurea* sp. and dock *Rumex* sp. and occasionally the seeds from the heads of tall grasses. They sometimes fly to the edge of ditches to bathe or drink, or up into the trees to feed on birch catkins, or they even pick up seeds from the ground, such as a road surface.

When in 1963 a survey of the 39ha(96ac) of Western, Isle of Wight, Bayfield and Central Plains was started, the number of goldfinch territories was:- '63 1, '64 0, '65 0, '66 1, '67 0, '68 2, '69 1, '70 2, '71 1, '72 1, '73 4, '74 4, '75 3, '76 3, '77 2, '78 2, '79 1, '80 0, '81 0, '82 0, '83 0, '84 0, '85 0 (D.A.B., W.D.M.). Thus the number of territories on the plains increased to four in 1973 and 1974 but decreased again and have been absent since 1980. In Britain there was a large upward change in 1977 with a + 45% for farmland goldfinches (Marchant 1978) but in 1978 they declined e.g. - 41% on farmland, reversing abruptly the general upwards trends of recent seasons (Marchant and Hyde 1980a,b).

The disappearance of the linnet *Acanthis cannabina* was discussed by Beven (1987) and was thought to be due to the increased use of herbicides on broad-leaved weeds on farmland. The longterm decrease in Britain as a whole is continuing. They are roughly a quarter of their strength in the datum year of 1966 (Marchant and Whittington 1988).

Redpolls *Acanthis flammea* were regarded by Carrington *et al.* (1944) as 'very scarce, occasionally heard but only on the wing while passing over'. Nevertheless, they probably bred on the Common in 1934. Melliush (1960) regarded the redpoll as a species resident nearby and visiting the Common for food in winter, however, later he found a few present in the summer (Melliush 1969). When the number of singing redpoll territories was mapped on Western, Isle of Wight, Bayfield and Central Plains 39ha(96ac) from 1964 to 1985 it was found there were:- '64 2, '65 3, '66 5, '67 4, '68 4, '69 6, '70 6, '71 4, '72 4, '73 5, '74 3, '75 1, '76 1, '77 0, '78 1, '79 0, '80 0, '81 0, '82 0, '83 0, '84 1, '85 0 (D.A.B.,

W.D.M.). The number of singing male territories in Eastern Wood 16ha(40ac) observed from 1949 to 1988 (the census was not done in 1958, 1986 and 1987) was none, except in 1972 when there were two territories, and in 1977 when there was one. It is of some interest therefore that in 1972 redpoll numbers in Britain had increased 4½-fold over 1964 (Batten 1973), but by 1978 there was a large decline, reversing abruptly the general upward trends (Marchant and Hyde 1980) and by 1987 the decline had reached the lowest index level for 20 years (Marchant and Whittington 1988). The reason is not clear.

Increased numbers of redpolls arrive in the autumn to feed on the birch catkins, occasionally searching the birch twigs and trunk, and the nooks and crannies of oak bark, probably for minute insects. They often descend to the herb layer to feed on seeds of hairy willowherb *Epilobium hirsutum* and hoary ragwort *Senecio erucifolius*. They may search the burnt ground or short grass, presumably for seeds. They occur in groups of between two and 35 in autumn and winter months.

Crossbills *Loxia curvirostra* are occasionally seen flying over. In 1966 four were seen flying over Western Plain on 10 July and two on 9 October when two were also noted over Eastern Wood (G.B., D.V.F., F.C.R.). On 7 May 1984 a party of 15 were calling while flying east over Western Plain (D.A.B.).

The bullfinch *Pyrrhula pyrrhula* is moderately abundant and nests annually (Carrington *et al.* 1944). The number of territories on Central, Bayfield, Isle of Wight and Western Plains 39 ha(96ac) from 1964 to 1985 was:— '64 4, '65 9, '66 9, '67 10, '68 10, '69 6, '70 7, '71 8, '72 7, '73 7, '74 8, '75 9, '76 10, '77 6, '78 7, '79 5, '80 6, '81 6, '82 6, '83 4, '84 6, '85 8 (D.A.B., W.D.M.). The territories varied from four to ten. The number of territories in pedunculate oakwood, Eastern Wood 16ha(40ac) from 1949 until 1988 was:— '49 2, '50 2, '51 2, '52 4, '53 4, '54 5, '55 3, '56 4, '57 —, '58 2, '59 3, '60 2, '61 2, '62 1, '63 2, '64 2, '65 2, '66 2, '67 2, '68 2, '69 3, '70 4, '71 1, '72 4, '73 2, '74 2, '75 2, '76 2, '77 2, '78 0, '79 2, '80 0, '81 0, '82 0, '83 2, '84 2, '85 —, '86 —, '87 0, '88 0 (G.B., L.M., A.M.). Thus the territories varied from 0 to five. In 1978 and 1979 there was a large decline generally in Britain (Marchant and Hyde 1980 *a* and *b*) although at Bookham it was more noticeable in woodland than in scrubland.

The bullfinches take rose hips, peck the flesh of hawthorn berries and pick the seeds of willow, ash and birch in autumn and winter, when they also visit the herb layer to eat seeds e.g. those of umbelliferous plants, grasses such as *Deschampsia caespitosa* and are often found among the meadowsweet *Spiraea ulmaria*. In woodland they may be seen to take berries of honeysuckle *Lonicera periclymenum* and carry them to an oak branch to eat them, perhaps up to nine in succession. In spring they eat large quantities of the early leaf buds of oak, willow, hawthorn and blackthorn, sometimes singing and eating hawthorn buds at much the same time! They will also pick seeds from the ground, even the snow and often drink from puddles.

The hawfinch *Coccothraustes coccothraustes* has been a regular winter visitor to Western Plain, sometimes spreading as far as Bayfield and Central Plains, to feed on the berries of hawthorn and blackthorn. Carrington *et al.* (1944) state that '...it is usually to be seen, and flights of as many as eight birds have been observed...'. Perhaps more were seen in the winter of 1959-60, when W. D. Melliush also saw one on the ground in a burnt area sq.81, in 1969-70 when 20-30 were present (C.H.) and in 1979 there was a flock of at least 20 (B.M.). They largely move away in March and April. However a few breed in the woodland: there was a territory in Eastern Wood in 1952, 1968, 1970 and in 1984 when L. Manns saw an adult feeding a young one. On 11 June 1944 an adult and several young were seen in Hillhouse Wood (A.R.W.), and in South-east Wood a pair was present on 11 May 1947 (P.W.E.C.). On 24 May 1948 a pair was very noisy in Station Copse (J.S.W.) and on 13 May 1951 one was seen in Stents Wood West 258 (G.B.). There were two on Bayfield Plain on 10 June 1978 (G.W.), one was on Central Plain sq.87 in June 1944 (R.W.H.) and one at 843 on 4 May 1985 (D.A.B.).

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Mammals (Geoffrey Beven)

General

A weasel *Mustela nivalis* was observed four times during the year, near the Isle of Wight sq.57-58 and in Hill House Wood 544 (I.S.). A badger *Meles meles* and cubs were recorded from the north of the Common (I.S.). The roe deer *Capreolus capreolus* remains common; there were 21 records of single deer, two deer were seen eight times, three together were seen twice, a doe with one kid was seen on two occasions and a doe with newborn twins was seen once (E.W.G., A.M., A.N.P., I.S., P.T., M.T., A.S.W.). On 23 January a doe was attacked by a dog, and had to be killed, while on 12 December a juvenile doe was killed, apparently by two greyhounds (I.S.). On 16 October the skeleton of a roe deer was found under a large fallen (storm-damaged) birch at the edge of Sheepbell Pond. The first evidence of a casualty from the storm of October 1987 (I.S.).

Harvest Mouse

In 1955, when small-mammal trapping was started on Bookham Common, a harvest mouse *Micromys minutus* was caught on Central Plain (Harrison 1956). Further trapping in 1959 caught one on Bayfield Plain sq.73, one on the Isle of Wight Plain sq.49 and two on Eastern Plain sq.82-83 (Lord 1961). J. Lord also caught five on Central Plain in 1962 (Beven 1963). Three empty nests were found on Central Plain 867 in April 1962 (Teagle 1964), another on Central Plain 855 by Joan Stoddart in 1974, and another on Western Plain 468 on 12 April 1975 by Nigel Davies. The nests were built on grasses such as *Deschampsia caespitosa* and very young hawthorn stems, at 30-60cm (1-2ft) above ground. An increase in harvest mice probably occurred following an increase in the size of grasses after the reduction and then cessation of grazing in 1930-45 and the reduction of rabbits after the introduction of myxomatosis in 1954 (Teagle 1964).

Dormouse

On four occasions during the winter dormice *Muscardinus avellanarius* have been found asleep in nests on the ground at the foot of a hawthorn, in Central Wood 5683 in 1977, on Bayfield Plain 763 in 1980, on Central Plain in 1982 at 813 and in 1985 at 824 (N.D., I.S.), and one was found awake and active in August in Central Wood sq.55. In the summer their activities are usually nocturnal so they are seldom seen. When found in the winter they are hibernating but they may wake up quite quickly when disturbed. In 1980, when

Ian Swinney moved the nest to a similar site nearby (as the tree was cut down), the dormouse squeaked a little and then went to sleep again. On 26 January 1982 Ian Swinney found a dormouse hibernating and cold in its nest, but it began to stir in about half an hour when it had become warm. He kept the dormouse in a cold part of his house, with the window open, until April 1982. It would wake up, feed and drink and go back into hibernation several times during the winter (Beven 1983). Another dormouse found hibernating on 22 December 1985 was moved and left in his van, but after half an hour it woke up and escaped. The winter nests were found on the ground and three were constructed of leaves and grasses, the latter being wrapped in all directions making an almost impenetrable wall, but one was made of thin strips of bark.

They apparently move largely in the branches of shrubs and this may explain why they are seldom caught in ground traps or by owls. They are 'rarely found in owl pellets' (Corbet and Southern 1977). 'Another check which might well prove interesting would be the examination of tawny owl pellets in a dormouse district to find out how often, if at all, they are taken' (Hurrell 1962). In Eastern Wood from 1950 to 1974 pellets of tawny owls *Strix aluco* were examined, the bones of one dormouse were found among 385 other mice, voles and shrews (as well as rats, moles, rabbits and frogs) (G.B.).

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Odonata (Ruth Day*)

The large red damselfly *Pyrrhosoma nymphula* is still present at Sheepbell Pond. Two individuals were seen there on 4 July together with a few azure damselflies *Coenagrion puella*. The latter species had emerged by the end of May at both Lower Eastern Pond and South East Pond. Fifty-two males were counted on the branched burr reed *Sparganium erectum* at South East Pond on 25 May. The 28 May was also sunny and a male broad-bodied chaser *Libellula depressa* was seen at Lower Eastern Pond. No further visits to Bookham Common were made until the end of July. During this week individual males of the common darter *Sympetrum striolatum*, the southern hawker *Aeshna cyanea* and the brown hawker *Aeshna grandis* were seen at Lower Eastern Pond.

A mark/recapture study was carried out during the last week of July. The number of damselflies captured each day at South East Pond and Lower Eastern Pond are set out in Table 1. As the weather affects significantly the number of Odonata to be found, light and temperature were also recorded. Wind intensity is not such an important factor at the Bookham Common ponds, as they are sheltered by the surrounding trees. The light was measured with the meter built into a Pentax ME Super camera. The hand-held camera was set to 64ASA and f8 and then focussed from a standing position on a piece of white A4 paper

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placed nearby on the ground. The shutter speed given by the automatic setting was noted. These readings were then converted to lux using the formula:

$$\frac{215.278f^2}{TS}$$

where f is the aperture number, T is the shutter speed in seconds and S is the ASA film speed.

Only 12 male *C. puella* were caught at South East Pond on Thursday 28 July, and some were too cold to fly and were picked off the reeds by hand. The day was overcast and cold with a typical air temperature of 16°C.

Throughout this study of three Bookham Common ponds, Sheepbell, Lower Eastern and South East, which started in 1985 (Day 1987, 1988), all three had until 1988 been covered in duckweed, mostly *Lemna minor*. Lower Eastern and South East ponds also had a great deal of submerged aquatic weed including hornwort *Ceratophyllum demersum* and Canadian pondweed *Elodea canadensis*. In the summer of 1988, however, although the other two ponds were unchanged, suddenly the water of Lower Eastern Pond was clear, unobscured by weed of any kind and through the clear water, several people, including the warden, Ian Swinney, had noticed quite large fish. An angling club uses Isle of Wight Pond where they have introduced various species of coarse fish, including carp – so presumably someone had, since the summer of 1987, transferred some of these fish to Lower Eastern Pond, where they had gradually eaten all the weed, together with the *C. puella* larvae sheltering in it.

A comparison between survey results for Lower Eastern and South East ponds on the same days in the same weather conditions (Tables 1, 2 and 3) shows that while the South East Pond population of *C. puella* males was at a reasonable level for an indifferent summer (mean estimated population 153), that at Lower Eastern pond was too low to estimate with Jolly's method (Begon 1979). What is perhaps even more interesting, however, is that the emerald damselfly *Lestes sponsa* population at Lower Eastern Pond has held up so well despite the depredations of the fish. This species has a short larval period, normally hatching from the egg in April, growing rapidly as a larva in the spring and early summer and emerging as an adult in July (Corbet 1956). The eggs, most of which must have been laid into the stems of the reedmace *Typha latifolia* around the pond, would have overwintered quite safely and hatched normally. By the time they did so, most of the non-woody weed in the middle of the pond would already have been eaten and so they would not have ventured out from the densely packed beds of reedmace, where presumably enough other aquatic animals had also found shelter from the fish to provide an adequate food source.

Table 3 shows the fluctuations recorded over four years in the mean population estimates for males of the two damselfly species at two ponds. The other Odonata species known to breed at Bookham Common is, of course, *Aeshna cyanea* the southern hawkers, and not as wrongly stated in the final paragraph on page 157 of *Lond. Nat.* 67, *Anax imperator*.

TABLE 1. Summer 1988. Temperature, light and number of damselflies of each sex and species caught on each day of fieldwork.

Date	S.E. Pond				L.E. Pond					
	Air temp °C	Light thousand lux	Time	D. ct. <i>C. puella</i> ♂	Time	Damsselfies caught				
July						<i>C. puella</i> ♂	<i>C. puella</i> ♀	<i>L. sponsa</i> ♂	<i>L. sponsa</i> ♀	<i>L. elegans</i> ♂
Tu 26	20	27	12.44	34	14.15	3	1	30	10	1
W 27	19	13	14.21	30	12.21	17	1	39	4	–
Th 28	16	2	14.30	12	12.30	4	–	36	3	3
F 29	19	13	12.17	43	14.37	3	2	33	1	–
S 30	17	2	15.20	29	13.30	3	–	30	1	1

TABLE 2. Population estimates for males of two species of damselfly at Bookham Common for 1985-8 using Jolly's stochastic method.

Date	July					August											
	26	27	28	29	30	1	2	3	5	6	7	8	9	11	12	17	
Male <i>Coenagrion puella</i> at Lower Eastern Pond																	
Year																	
1985	-	-	-	165	-	187	-	172	165	133	206	92	-	131	-	-	
1986	-	-	-	-	-	-	363	-	-	-	-	609	284	-	-	-	
1987	188	219	178	-	146	-	-	-	-	-	-	-	-	-	-	-	
1988	<i>C. puella</i> was too rare at Lower Eastern Pond for mark/recapture calculations																
Male <i>Coenagrion puella</i> at South East Pond																	
Year																	
1985	-	-	-	-	-	-	-	-	117	210	235	230	-	178	101	236	
1986	No survey work was done at South East Pond																
1987	188	478	273	-	649	-	-	-	-	-	-	-	-	-	-	-	
1988	-	198	132	128	-	-	-	-	-	-	-	-	-	-	-	-	
Male <i>Lestes sponsa</i> at Lower Eastern Pond																	
Year																	
1985	<i>L. sponsa</i> was too rare at Lower Eastern Pond for mark/recapture calculations																
1986	-	-	-	-	-	-	352	-	-	-	-	352	133	-	-	-	
1987	106	124	185	-	253	-	-	-	-	-	-	-	-	-	-	-	
1988	-	566	75	65	-	-	-	-	-	-	-	-	-	-	-	-	

TABLE 3. Population mean of three consecutive samples for each year of the study using the Jolly estimates.

Year	<i>Coenagrion puella</i> at Lower Eastern Pond		<i>Coenagrion puella</i> at South East Pond		<i>Lestes sponsa</i> at Lower Eastern Pond	
	Dates	Mean popn	Dates	Mean popn	Dates	Mean popn
1985	Aug. 1, 3, 5	175	Aug. 6, 7, 8	225	Too rare for Jolly estimates	
1986	Aug. 2, 8, 9	419	Not surveyed		Aug 2, 8, 9	279
1987	July 26, 27, 28	248	July 27, 28, 30	397	July 27, 28, 30	187
1988	Too rare for Jolly estimates		July 27, 28, 29	153	July 27, 28, 29	235

Note: I am indebted to David W. Allen, librarian of the Horniman Museum, London Road, SE23 3PQ, for the lux conversion formula. He got it from an American gardening book and disclaims any responsibility for its accuracy. I have not myself been able to borrow a light meter recording lux to calibrate my camera against, but the formula seems to work well enough.

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Butterflies: Their Present Status (Alan S. Wheeler*)

In *The London Naturalist* thirty-four years ago I published 'A Preliminary List of the Macro-Lepidoptera of Bookham Common' (Wheeler 1955). Some of these observations are obsolete now so I shall be referring to them from time to time for comparisons.

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I have been visiting the Common spasmodically for nearly forty years and have noticed a marked decline in some species while others are just as numerous. As my visits have been so irregular and infrequent, many gaps in observations must exist.

Dr Geoffrey Beven has given some advice and accumulated a few reports, which are incorporated. These came from H. Baillie, G. Beven, D. A. Boyd, J. Bratton, N. Davies, Mrs M. Emblem, K. Gold, A. E. Le Gros, E. W. Groves, Miss E. M. Hillman, R. Kettle, P. W. King, D. Langlois, L. Manns, W. D. Melluish, Dr I. Menzies, A. Merritt, A. Snow, I. Swinney and K. J. Willmott.

Pararge aegeria ssp. *tircis* speckled wood. Common in woodland areas.

Lasiommata megera wall. Used to be common at the time of the last report, but the species has become very rare and has not been seen since 1978 (N.D.).

Melanargia galathea ssp. *serena* marbled white. One seen in 1985 (D.A.B.).

Hipparchia semele ssp. *semele* grayling. Very few single records before the last report. None seen since 1952.

Pyronia tithonus ssp. *britanniae* gatekeeper. Locally abundant.

Maniola jurtina ssp. *insularis* meadow brown. Abundant.

Coenonympha pamphilus ssp. *pamphilus* small heath. Sometimes common, per the last report, but few seen in recent years.

Aphantopus hyperantus ringlet. Abundant.

Boloria selene ssp. *selene* small pearl-bordered fritillary. One caught in 1970, near Central Ditch. A few second brood specimens, bred in 1971 from another locality, were released at the roadside between the railway tunnel and the Keeper's Cottage. Recorded also in 1985 (D.A.B.).

Boloria euphrosyne pearl-bordered fritillary. Used to be common in some years in areas bordering woods, but last seen in 1957. The decline of this species 'seems to have begun during the 1950s, and continued into the 1960s, principally coinciding with the decline in woodland coppicing, but exacerbated by the loss of rabbits through myxomatosis. This caused an alteration in the herb layer of coppice woodlands which shaded out the violets on which the larvae depend.' (Plant 1987).

Argynnis aglaja ssp. *aglaja* dark green fritillary. While regarded as less common than the next two species when the 1955 report was written. I have only seen it certainly in 1952 and, doubtfully, in 1958.

Argynnis adippe ssp. *vulgoadippe* high brown fritillary. Used to be common in limited areas, especially near Glade Path. Since 1953, however, I have one doubtful record for 1956, three seen in 1957 and the last one in 1959. Seen in 1969 (I.M.).

Argynnis paphia silver-washed fritillary. Common until 1957. My last records were in 1959, apart from one f. *valezina* in 1976, that might not have been native to the area. Recorded in 1967 (K.G.) and 1983 (D.L.).

Vanessa atalanta red admiral. Migrant species, sometimes common. My last record was in 1964, but it has been reported from 1981 to 1985 (D.A.B., E.W.G., E.M.H., A.M.) and doubtless was present in other years also.

Cynthia cardui painted lady. Another migrant species, sometimes common. My last record was in 1968, but has been reported in 1980 and 1984 (D.A.B., W.D.M.) and doubtless was present in other years also.

Aglais urticae small tortoiseshell. This species was common but has been recorded only occasionally in recent years e.g. 1980, 1982, 1984, 1985 and 1987 (D.A.B., E.W.G., E.M.H., R.K.).

Nymphalis polychloros large tortoiseshell. One was seen in 1948 by L. Parmenter, and another in 1955 by W. D. Melluish. Otherwise there have been

no records of this rare species.

Inachis io peacock. A common species in earlier years, but has not been seen much more often than *A. urticae* recently. It was seen from 1980 to 1985 (D.A.B., J.B., E.W.G., E.M.H., R.K.) and regarded as frequent in 1981 (P.W.K.).

Polygonia c-album comma. Common in or near woods and has maintained a good hold.

Apatura iris purple emperor. Seen in 1947 and 1952 (per C. G. M. de Worms) and between 1 and 14 individuals have been observed in most years between 1969 and 1986 (G.B., D.A.B., N.D., E.M.H., M.E., L.M., W.D.M., A.M., A.S., K.J.W.). I saw one high in the trees in 1987. K. J. Willmott (1987) has been carrying out a special survey of this species, mainly on Bookham Common, for the World Wildlife Fund.

Ladoga camilla white admiral. Used to be most common in Central and Eastern Woods. In 1971 was 'exceedingly plentiful' and in 1974 an 'all black' var. *nigrina* was seen (Willmott 1975). In 1976 N. Davies counted 30 on a walk across the oakwood, and on 5 September 1976 H. Baillie found a fresh specimen which he thought must have come from a second brood. Remains well established but less common generally.

Hamearis lucina Duke of Burgundy fritillary. A few undated records were received for the 1955 report from reliable observers but nothing is known of the existence of the species since then.

Polyommatus icarus ssp. *icarus* common blue. Uncommon but recorded in some years – most recently in 1984 (D.A.B.).

Lysandra coridon chalk hill blue. Single specimens were reported in 1946 and 1947 of this species which occasionally wanders from its natural habitat.

Celastrina argiolus ssp. *britannia* holly blue. Apparently the species was seen frequently in 1947 and was present in 1948. I have seen it only in 1959 and 1988. It was reported in 1970 (A.E. Le G.), in 1971 'exceedingly plentiful' (Willmott 1975) and in 1984 (D.A.B.).

Lycaena phlaeas ssp. *eleus* small copper. It was reported in 1954 that it used to be fairly common in some years, but only single specimens have been seen more recently and only in some years such as 1965, 1971, 1973 and 1976 (G.B.), 1984 and 1985 (D.A.B.) and 1987.

Callophrys rubi green hairstreak. A few were reported before 1954. My only observation was in 1957.

Quercusia quercus purple hairstreak. Common in some years, occasionally very abundant, as in 1952. It was 'exceedingly plentiful' in 1971 (Willmott 1975). It remains well established and is reported most years.

Strymonidia w-album white-letter hairstreak. Single specimens were seen in 1952 and occasionally since. It was 'extremely abundant' in 1971 and common in 1972 (Willmott 1975) but decreased markedly when Dutch Elm disease destroyed the elms 1973-74. The last time I saw it was in 1976.

Pieris brassicae large white. Only seen occasionally.

Pieris rapae small white. More often seen than the last, but there are still only occasional records of this species.

Pieris napi ssp. *sabellicae* green-veined white. Common in some years and more often seen than either of the last two species.

Anthocharis cardamines ssp. *britannica* orange-tip. Common and well established.

Colias croceus clouded yellow. An infrequent migrant of which there are very few records, but reported in 1957, 1983 and 1984 (G.B., J.B., E.M.H., I.S.).

Gonepteryx rhamni ssp. *rhamni* brimstone. Common.

Erynnis tages ssp. *tages* dingy skipper. Common at the time of the last report, but not seen since 1959.

Pyrgus malvae grizzled skipper. Common at the time of the last report, but not seen since 1971.

Thymelicus sylvestris small skipper. Common and locally plentiful.

Thymelicus lineola Essex skipper. First recorded in 1970, seen by P. W. King in 1981, and identified by me in 1988; is probably well established.

Ochlodes venata ssp. *faunus* large skipper. Seen most years, sometimes frequently, until 1970, only occasionally since but was plentiful in 1987.

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Book Reviews

The Redshank. By W. G. Hale. 1988. 24pp. £1.25 on publication, 16 December 1988, increased to £1.95, January 1989. ISBN 0 85263 959 7.

The Avocet. By David Hill. 1989. 24pp. £1.95. ISBN 0 7478 0016 2. Both Shire Publications Ltd, Aylesbury.

These two titles are the latest issues (Nos 33 and 34 respectively) to be received in the Shire Natural History series and, like their predecessors, they provide the reader with a well-informed introduction to their subjects.

The redshank is one of our commonest waders and the one most birdwatchers first meet as they cross the marshes in the breeding season.

Professor Hale's study of the redshank is well known in the ornithological world and his New Naturalist volume *Waders* is a classic. The present small volume is excellently written and is embellished with some well-chosen and familiar photographs by Eric and David Hosking. Other photographs, presumably by the author, illustrate various biological topics relevant to the text which covers display and courtship, breeding, feeding, plumage and moults, distribution and taxonomy, migration and populations.

This familiar bird deserves the excellent attention it has been given.

Although not a common bird in the British Isles, the **avocet** is as well known to ornithologists as the redshank. This is due largely to the enormous success of its breeding management in Suffolk at the hands of the R.S.P.B. over the past 40 years. The author David Hill joined the R.S.P.B. as their senior ecologist in 1987, having previously been with the Edward Grey Institute and the Game Conservancy, and is eminently qualified to write this booklet, the largest part of which is devoted to the breeding cycle and to conservation and management. This is a very readable account of the biology of and the recolonization of Britain by this extremely attractive species.

K. H. HYATT

We have since received No. 36, *The Gannet*, by Bryan Nelson, No. 41, *The Song Thrush*, by Eric Simms, No. 43, *The Blackcap and the Garden Warbler*, by Ernest Garcia, No. 45, *Landsnails of the British Isles*, by A. A. Wardhaugh, and No. 48, *The Nightjar*, by Peter Tate. Ed.

Botanical Records for 1988

by RODNEY M. BURTON*

Summary

This paper presents the principal vascular plant records made in the London area in 1988, many of which are related to damage caused by the storm of October 1987 or to the B.S.B.I. Monitoring Scheme. Highlights are *Orchis purpurea*, *Ajuga chamaepitys* and *Nepeta cataria* in Bromley, *Coeloglossum viride* in South London, *Callitriche truncata* in Essex, *Scirpus tabernaemontani* in Herts, *Festuca rubra* × *Vulpia myuros* in Islington and *Baldellia ranunculoides* rediscovered in Barnet.

Introduction

This paper continues an annual series of reports listing the principal discoveries of vascular plants made in the London area, which is understood as a circle of radius 20 miles (about 32km) centred upon St Paul's Cathedral. The area extends beyond the London boroughs, into Kent, Surrey, Essex, Herts and small parts of the modern counties of Bucks and Berks, though there is nothing significant to report from west of the Colne this year. The paper is divided along lines laid down by Watson (1873) and used as a basis for recording plant distributions in Great Britain. He used the county boundaries of his day, but divided or merged some counties so that the resulting 'vice-counties' should be less unequal in size. The arrangement here is in the sequence of vice-counties as he numbered them. In those which are divided between London boroughs and modern counties, all the records from the former are given first.

The consequences of the devastating storm of 16 October 1987 continue to be observed. A year ago it was possible only to speculate what these might be. Reports received from some heavily wooded sites suggest that more long-term damage may have been done by equipment used for timber clearance than by the wind. The short-term effect to be mentioned here is the accidental occurrence of various species in bare ground created by the storm. Of particular interest are plants of *Conyza sumatrensis* south of London in Kent, which are perhaps not connected with the established colonies in east London discovered recently (Burton 1985: 113) but come from seed brought on the storm, which started in the Bay of Biscay, from the coastal region of south-west France where this species is abundantly naturalised.

The year 1988 also saw the conclusion of special efforts, started in 1987, to record the flora and vegetation of certain parts of the area designated by the Botanical Society of the British Isles (B.S.B.I.) for its 'Monitoring Scheme'. This was intended to collect data in a form which would allow comparison both retrospectively with the results published in the *Atlas of the British Flora* (Perring and Walters 1962) and prospectively with similar surveys in future years, making it possible to monitor changes. The method requires too much intensive work for the whole county to be surveyed in the same way as it was for the *Atlas*, so one ten-km square of the National Grid (the unit of mapping in the *Atlas*) in nine was surveyed. In the London area the squares covered were TQ 16, mostly in vice-county 17, Surrey but partly also in v.c. 21, Middlesex; TQ 19, divided between v.c. 20, Herts and v.c. 21; TQ 46, in v.c. 16, West Kent; and TQ 49, in v.c. 18, South Essex. Inevitably the coverage of this survey throughout the British Isles has been uneven, and this is reflected in the London area, where TQ 19 was rather poorly covered, whereas the other three were among those most comprehensively surveyed. Interesting new records produced by the Monitoring Scheme are repeated here in the appropriate section.

They include some of the major discoveries of the year, like lady orchid

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Orchis purpurea re-found in London in TQ 46. Others came to light either in the course of professional surveys, like frog orchid *Coeloglossum viride* in v.c. 17, or of amateur activity, like the *Callitriche truncata* found on an Essex Field Club meeting.

V.C. 16, West Kent

Most of TQ 46 is in the London Borough of Bromley. Even though this area has been intensely studied in recent years, the Monitoring Scheme provided the impetus for many discoveries there, especially by Joyce Pitt, her students and fellow members of the Orpington Field Club. On the upturned root-plate of a storm-felled beech tree in a Chelsfield garden, Roy Hurr found ground-pine *Ajuga chamaepitys*. At Furze Bottom Margaret Pearce and Pat Eade discovered wild catmint *Nepeta cataria* by a footpath. Neither of these rare native labiates has been seen wild in the borough before in living memory. Nor has *Lobelia urens*, found by Joy Andrews in a garden in Orpington to which it had demonstrably been introduced with horticultural peat, but such obviously casual occurrences are not relevant to the purposes of the Monitoring Scheme. In central Bromley Ishpi Blatchley and Gordon Corbet found shining cranesbill *Geranium lucidum* and climbing corydalis *Corydalis claviculata* in unexpected surroundings. On Hayes Common, one of the best explored sites in the square already, Graham Hemington found a population of the glandular-hairy eyebright *Euphrasia anglica*, which has always been rare in London. At High Elms Mrs Pitt found the population of *Conyza sumatrensis* mentioned in the Introduction, together with large numbers of seedlings of tomato *Lycopersicon esculentum*, which must have had a different origin.

This *Conyza sumatrensis* population was discovered independently by Geoffrey Kitchener, who also found another one in similar circumstances not far away near Farnborough church. It was he who re-discovered *Orchis purpurea* in the area, in a site where it had previously been seen over twenty years before. There were three plants, one of which was in flower, so it should last a few years longer. I had looked for it there myself without success; storm damage has made movement in parts of this wood more difficult. I spent a lot of time myself on the Monitoring Scheme, but in London found nothing more exciting than a rare fumitory *Fumaria densiflora* near High Elms, an under-recorded water-starwort *Callitriche obtusangula* at Ruxley gravel pits and small-leaved lime *Tilia cordata* of doubtful status in Birthday Wood.

These are not quite the only worthwhile 1988 plant records from London boroughs in v.c. 16. In Bostall Wood Peter Holland and Margaret Kennedy found several plants of broad-leaved helleborine *Epipactis helleborine*, the flowers of which were being visited by a common wasp; they suggest that better light following 1987 storm damage had stimulated the growth of this orchid, of which we have no other records so close to Central London in Kent. John R. Palmer added orange balsam *Impatiens capensis* to the list of drift-borne plants observed at Crayford Ness, where *Angelica archangelica* and wild celery *Apium graveolens* are more to be expected. On Chislehurst Common he found two large patches of a naturalised suckering shrub *Osmaronia cerasiformis*, a rare instance of an alien plant which I succeeded in identifying where he had failed: it is a native of California allied to *Prunus*, cultivated for the sake of its fragrant early blossom, and has previously been recorded in the wild in Britain only once to my knowledge, from Hampstead Heath (Clement 1978).

A small part of TQ 46 is still administratively in Kent and was not neglected for the Monitoring Scheme. It includes Halstead, where I found a population of a rare hybrid cinquefoil *Potentilla* $\times$ *suberecta*, and Hollows Wood is on the Kent side of the boundary. Mr Kitchener produced a long list from a 2 $\times$ 2km square straddling this part of the boundary, from which I select for mention here *Prunus serotina* well established at the wood edge, where it had previously

been noted by Mr Palmer, and a plant of *Conyza sumatrensis* near Knockholt station which flowered well into January 1989.

Both also supplied highly interesting lists for other parts of the vice-county. Mr Kitchener's included large bitter-cress *Cardamine amara* in two places at Shoreham and a plant of *Nepeta cataria* on a building site east of Dartford. Mr Palmer found *Nepeta* at Northfleet, flixweed *Descurainia sophia* in central Dartford and a plant of mistletoe *Viscum album* a foot above the ground on an apple tree among deserted factory buildings east of Dartford. In such a situation the mistletoe, which can be very long-lived if not cut down before Christmas, is likely to have been planted at a time when the tree was in very different surroundings. Mr Palmer is well known for his interest in plants which have escaped from cultivation; in 1988 these included *Pyracantha rogersiana* in downland at Kemsing (determined at Wisley) and the distinctive spring bulb *Ipheion uniflorum* on a roadside bank at Hextable.

V.C. 17, Surrey

The last paragraph of the introduction mentioned the discovery of *Coeloglossum viride* in London. A single plant of the frog orchid was found on a golf course during a survey of chalk grassland in London conducted by Stuart Hedley and others for the Nature Conservancy Council. Other plants mentioned in these reports, as it happens all from either Croydon or Sutton, though the habitat is not confined in London to these boroughs, are one man orchid *Aceras anthropophorum* on a different golf course, imperforate St Johns-wort *Hypericum maculatum* on Kenley Common, knapweed broomrape *Orobanche elatior* in Sutton Park, on Addington Court golf course and in a third site where there was a single plant, and greater yellow rattle *Rhinanthus angustifolius*, also seen in Sutton Park. Mr Hedley has suggested that this nationally rare species was somehow accidentally transferred to the park from the well-known populations south of Coulsdon on vehicles belonging to Croydon Borough Council, which is responsible for the maintenance of both these properties, and also of Kenley Common and Coulsdon Common, where it was noticed in 1987 by Lady Rosemary Fitzgerald. In some of these places there are large numbers of the species, and even experienced botanists have admitted to difficulty distinguishing it from the 'common' yellow-rattle *P. minor*, though I have yet to see satisfactory evidence of hybridisation.

A few other interesting 1988 records are from London boroughs in v.c. 17. Elizabeth Norman found *Doronicum columnnae*, determined by A. C. Leslie, in a place by the water's edge of Lonsdale Road Reservoir where she insists it could not possibly have been planted, and large numbers of a hybrid willow-herb *Epilobium adenocaulon* × *montanum* in a derelict churchyard in Barnes. Joyce Smith and Ken Page were able to confirm the continued existence of small water-pepper *Polygonum minus* on Ham Common.

Much of TQ 16 falls in the modern county of Surrey south of the Thames, and here several interesting records were made in 1988. Mrs Smith, Julia Leslie and Mr Page discovered a group of two or three hundred plants of lesser centaury *Centaureum pulchellum* in Princes Coverts. In the water of the pond on Ditton Common, Mrs Leslie and Mrs Smith found parrot's feather *Myriophyllum aquaticum*, an alien from South America which is proving to be hardy, although its use in cultivation in this country is mostly indoors, where like other aquatics grown it increases too rapidly. More of it was taken from a new lake in Nonsuch Park by J. B. S. Hodge. Roger Hawkins discovered great woodrush *Luzula sylvatica* on Esher Common; can it really not have been seen there before, even by H. C. Watson a century ago, who knew this common so well? Mrs Norman, working westward from Hampton Court Bridge, found soft clover *Trifolium striatum* and the rare variety of crow garlic *Allium vineale* with the umbel containing numerous flowers and no bulbils. Two rare fumitories

together, *Fumaria muralis* subsp. *boraei* and *F. densiflora*, were, alas, only casual, and even if the alien cinquefoil *Potentilla intermedia* and mullein *Verbascum phlomoides* in a gravel-pit were of better status they have no more chance of persisting as the pit has since resumed working. Another abandoned gravel digging had flowering rush *Butomus umbellatus* and a pondweed *Potamogeton pusillus*, verified by C. D. Preston, and also near Walton-on-Thames Mrs Norman found the hard rush – soft rush hybrid *Juncus* $\times$ *diffusus*, determined by T. A. Cope.

Elsewhere in this part of our area, B. E. Smythies found a third rare fumitory *F. vaillantii* on Ashted Hill, Merstham and from its circumference Eleanor Isherwood reported alexanders *Smyrniololus atrum* and water fern *Azolla filiculoides* at Reigate, the latter in the grounds of the castle.

V.C. 18, South Essex

Parts of TQ 49 are in London boroughs. The best group of discoveries made in the course of the Monitoring Scheme in 1988 in this part of London was in and near Foreberry Woods, west of Havering Park by Ken Adams. As well as an extensive colony of dwarf furze *Ulex minor*, there were sharp-leaved fluellen *Kickxia elatine*, bearded couch *Elymus caninus* and common centaury *Centaureium erythraea*. Near Willoughby's Hill in an area of pasture Dr Adams found a small cattle-drinking pond whose flora included *Ranunculus aquatilis*. Details of the distribution of water-crowfoot species are poorly known, but this one appears to be less common than *R. peltatus*.

Dr Adams is also responsible for all the records in this paragraph, from other parts of London boroughs north of the Thames and east of the Lea. The flora of Wanstead Park was exhaustively described by Ferris (1980) and it must be likely that any additional species have arrived since then. A few years ago it was suggested that the bladderwort *Utricularia australis* (*neglecta*) was being accidentally transported from pond to pond in Epping Forest by conservation students, but Heronry Pond at Wanstead is rather further from High Beach for this explanation to be satisfactory. He visited other parks too: Bedford's Park lake had fan-leaved water-crowfoot *Ranunculus circinnatus* and the now already too common alien *Crassula helmsii*, and in Havering Park there were large stands of the alien *Polygonum polystachyum* and tor-grass *Brachypodium pinnatum*. The latter has been known for many years but does not seem to have been mentioned before in L.N.H.S. publications; in this isolated population, some way from its usual calcareous habitat, the status of this species must be rather doubtful. The pond by the Rising Sun at Woodford has been covered in ice and even a layer of snow since *Azolla filiculoides* was first found there, so its persistence here suggests to Dr Adams that control of this species by frost is a myth. The winter of 1988/89 will hardly have put this suggestion to the test.

That part of TQ 49 which is still in Essex includes most of Epping Forest, the flora of which is already very well known, so it is hardly likely that surveys for the Monitoring Scheme would produce any additions to it. However they could still provide the opportunity for recording the present abundance of some of the rarities, which will be of interest not only when the survey is next repeated but also, I guess, now. The one population of heath spotted-orchid *Dactylorhiza maculata* numbered 31 spikes in 1988. Water avens *Geum rivale* is still present in the same one locality. Harbell *Campanula rotundifolia*, which used to be in numerous grassy places in the forest, is now virtually reduced to the population in High Beech churchyard. In a site where marsh fern *Thelypteris palustris* was planted some years ago by an unknown (but strongly suspected) hand, the considerable extent of its increase could be described. Elsewhere in TQ 49 a number of plants were shown by the survey to occur in a single locality in the square. Among these are rough hawkbit *Leontodon hispidus* in the Roding Valley, cyperus sedge *Carex pseudocyperus* and fine-leaved water-dropwort

Oenanthe aquatica in a small pond in the middle of a field at Lambourne and rest-harrow *Ononis repens* near Knolls Hill Farm.

I am indebted to Dr Adams for all these, and it was also he who has already reported elsewhere (Adams 1988) the major discovery of short-leaved water-starwort *Callitriche truncata* during a meeting of the Essex Field Club on 11 September. This was not quite a new vice-county record, the first having been made earlier in the year well outside our area. Surely these records imply that it may be expected elsewhere in similar situations: water shallow enough for a small plant on the bottom to be seen, with little movement but clean. A small submerged aquatic with opposite, translucent but reddish-tinged oblong-linear leaves is likely to be worth a closer look. The site where this was found in September was the fishing lake below Great Myles. To reach it the party had followed a right-of-way through a farm which specialises in dried flowers and herbs; it must be a strange experience to walk through a field of spearmint *Mentha spicata*. They found penny-royal *M. pulegium* as a relic of cultivation and a yellow-flowered alien subsequently identified as *Achillea ageratum* naturalised by the buildings. Other native plants of great interest seen that day were *Carex pseudocyperus* and wood club-rush *Scirpus sylvaticus* in the lake-side marsh and thin-spiked wood-sedge *Carex strigosa*, square-stemmed St John's-wort *Hypericum tetrapterum* and lady-fern *Athyrium filix-femina* nearby in Menageria Wood.

Our own meeting on 30 July visited Grays Chalk-pit, a much better known locality. By the path approaching the pit David Bevan spotted a hybrid willow-herb *Epilobium adenocaulon* × *parviflorum*. A couple of critical plants noted inside by Mr Palmer were *Cirsium arvense* var. *mite* which has heads just like those of the ordinary creeping thistle, but much more manageable leaves, and the firethorn *Pyracantha coccinea* var. *lalandei*. Earlier in the year Mr Kitchener had noticed an abundance of Danish scurvy-grass *Cochlearia danica* on the central reservation of the A12 from the Brentwood by-pass to a point much too far from London to be specified here.

V.C. 19, North Essex

Three records made independently are from localities very close to each other in the Lea Valley near Fishers Green. First place must go to Bob Dyke's group of 38 bee orchids *Ophrys apifera*. The filled gravel pit in which they were found is ominously close to ground ploughed later in the year, it is thought as a preliminary to the planting of native trees. Judy Adams found *Myriophyllum aquaticum* choking a new pond. Yellow vetchling *Lathyrus aphaca* was Paul Tout's plant; he also found *Oenanthe aquatica* half filling a small pond on Copt Hall estate. All of these except the first were communicated to me by Dr Adams, who himself reported alexanders *Smyrniium olusatrum* from roadsides at Thornwood Common and North Weald Bassett many miles from the neighbourhood of tidal water where alone it is common. Fox-tail barley *Hordeum jubatum* by the slip road from the M11 has been known for many years, but not previously published as a North Essex plant.

V.C. 20, Herts

The area which used to be in Hertfordshire and is now in the London Borough of Barnet continues to produce new records of interest. Anthony Vaughan's long and excellently detailed list of records included Smith's cress *Lepidium heterophyllum* on the west side of Brunswick Park and abundant blinks *Montia fontana* in a paddock near Arkley village hall, both in this area. Trevor James reported fine-leaved sheep's-fescue *Festuca tenuifolia* and hair-leaved water-crowfoot *Ranunculus trichophyllus* on Rowley Green, and confirmed the earlier discovery by M. J. Smith and J. Tyler of floating club-rush *Scirpus fluitans* in the pond there. Diana Griffith's further additions to her published list of the

flora of Totteridge (Griffith 1986) are *Leontodon hispidus* and corn-salad *Valerianella locusta*, both from grassland north of White Fathers. The latter was found in 1987, but not identified until after she had placed a specimen in the 'Help' exhibit at the B.S.B.I.'s 1988 annual exhibition. This is a useful way of starting on the identification of totally unfamiliar plants but the results obtained are to be treated with caution! In the case of *Valerianella*, it is well known that fruiting plants are needed for identification of the species, but not always appreciated that a fruit can be fully formed in a lower dichotomy of an inflorescence the upper branches of which still bear flowers.

The only Herts records of note from the Monitoring Scheme square TQ 19 in 1988 appear to be those made at a Hertfordshire Natural History Society field meeting at Aldenham Reservoir, at which *Carex pseudocyperus*, marsh ragwort *Senecio aquaticus* and in ditch cleanings sowbane *Chenopodium hybridum* were found. These were communicated to me by Trevor James, who himself found glaucous bulrush *Scirpus tabernaemontani* new to Herts and purple osier *Salix purpurea* at Park Street Pits and the alien duckweed *Lemna minuscule* at Moor Mill. Many other Herts records were received by this route. Joan Colthup found marsh willow-herb *Epilobium palustre* and horned pondweed *Zannichellia palustris* on Bachworth Heath. The bladderwort in the pond here has been referred to *Utricularia vulgaris* (e.g. Dony 1967: 89), but Olive Linford found a flower on it, preserved in what is in effect the county herbarium at Baldock, proving that it is *U. australis*. Near Hatfield, David Marshall found three-cornered leek *Allium triquetrum* new to Herts, slender tufted-sedge *Carex acuta* near Oxleas Wood, and at Sleafshyde Pits the hybrid of false fox-sedge and remote sedge *C. × pseudoaxillaris* and ploughman's spikenard *Inula conyza*, the latter a rare plant on non-calcareous soils. At Bricket Wood, Patricia Baker found *Dactylorhiza maculata*, bristle club-rush *Scirpus setaceus* and bogbean *Menyanthes trifoliata*. A long list of plants recorded by Trevor himself in this excellent locality in 1987 included pale sedge *Carex pallescens*, carnation sedge *C. paniceo*, *Hypericum maculatum*, greater burnet-saxifrage *Pimpinella major* and bell-heather *Erica cinerea*.

On the other side of Watford, Peter Ellison sent me some interesting notes from the grounds of Merchant Taylors School. Fringed water-lily *Nymphoides peltata* and arrowhead *Sagittaria sagittifolia* were in the Colne, a possible golden dock *Rumex maritimus* was on a gravelly lake shore, and there was also a single bee orchid *Ophrys opifera*. Another of the same was found by Clive Herbert, together with two groups of common spotted-orchid *Dactylorhiza fuchsii*, in a railway siding north of Bayford Station. At the edge of our area Peter Holland found a thriving colony of small teasel *Dipsacus pilosus* near Symondshyde Wood. At Broxbourne David Bevan found a hybrid dock *Rumex conglomeratus × obtusifolius* and an alien mullein *Verbascum phlomoides*.

The last are in the area searched very thoroughly in 1988 by Ann Boucher, which ranges north at least to the edge of our circle, and at which she found upright bedstraw *Galium album* in a field by the railway near Handmead Lock, small numbers of horseshoe-vetch *Hippocrepis comosa*, kidney vetch *Anthyllis vulneraria* and meadow sage *Salvia pratensis* on recently disturbed chalk near the Nag's Head; how can they have got there? I only have space to include a selection of Mrs Boucher's numerous excellently detailed records, but so many of them are of such interest that it will have to be a very generous selection. New to our area are the malvaceous *Sidalcea oregana*, presumably of garden origin, a single plant on dumped soil by the A414, and the rare subspecies *chalepensis* of hoary cress *Cardaria draba* found in Hertford. Stinking mayweed *Anthemis cotula* and broad-leaved spurge *Euphorbia platyphyllos* are both rare arable weeds nowadays, found in the corner of a field by Balls Wood with dwarf spurge *E. exigua* and both native species of *Kickxia*. In Broxbourne Woods she found the hybrid cinquefoil *Potentilla × italica* and the very similar species *P. anglica*, which is best confirmed by the presence of a well-formed head of fruit.

Four clumps of *Luzula sylvatica* were in Hoddesdon Park Wood and two of the rough comfrey *Symphytum asperum* by the A414 roundabout at Hertingfordbury. She found 'several yards' of the water whorl-grass *Catabrosa aquatica* in a stream at 'The Lynch' and orange balsam *Impatiens capensis*, together with *Lemna minuscula* and some *Azolla* in Broxbourne mill stream. She found one of the less common water-starworts *Callitriche platycarpa* in the New River at Broxbourne and extended the known range of river water-dropwort *Oenanthe fluviatilis* in the same artificial water-course back to Hoddesdon.

V.C. 21, Middlesex

Brian Wurzell's well-known eye for an unusual hybrid was responsible for yet another triumph of identification in 1988. During a course given to British Trust for Conservation volunteers on 7 June, he chanced upon a cross between the common red fescue *Festuca rubra*, a creeping perennial, and the tufted annual rat's-tail fescue *Vulpia myuros*. The hybrid was perennating well and its *Festuca* parent was more precisely indicated than in the four previous British records, none of which is from London. Its discovery was featured in the *Daily Mail*, *The Guardian* and *The Independent* of 4 August. The locality was Gillespie Park, a former railway siding in Islington now available for nature study and informal recreation. It also has a good variety of leguminous plants, including grass vetchling *Lathyrus nissolia*, spotted medick *Medicago arabica*, smooth tare *Vicia tetrasperma* and slender bird's-foot trefoil *Lotus tenuis*. A later photo-call by Mr Wurzell, reported in *The Daily Telegraph* of 29 November, occurred when the colony of the hybrid *Artemisia* discovered by him a year before on Tottenham Marsh had been covered in an unauthorised soil dump.

It was also Mr Wurzell who had first noticed *Conyza sumatrensis* in London, cited earlier. Three additional records of this species made in 1988 are worth a mention. Within its previously known range, Roger Payne found a colony on the wall of Tower Hamlets Cemetery, inside which was some ragged robin *Lychnis flos-cuculi* which I would assume to be the result of sowing of wild-flower seed, though there is no evidence to support this assumption. In Sussex Gardens, W2 Geoffrey Kitchener found one small plant of the *Conyza*, near to a roundabout with vervain *Verbena officinalis* in the middle. The third record was in the list of plants from Hyde Park and Kensington Gardens produced by Elinor Wiltshire. This included numerous species not in Allen (1965), most of which were in places disturbed by the clearance of October 1987 storm damage, which created holes some of which were filled with soil brought in from elsewhere. The more unusual species included marsh dock *Rumex palustris*, storksbill *Erodium cicutarium*, hemp agrimony *Eupatorium cannabinum*, sedges *Carex divulsa* and *C. ovalis*, water chickweed *Myosoton aquaticum* and another alien *Crepis tectorum*, determined by J. M. Mullin at the British Museum (Natural History). Mrs Wiltshire also did a list from the Mudchute on the Isle of Dogs, including hoary alison *Berteroa incana*. Another rare crucifer found on the Isle of Dogs is *C. Westall's Cardaria draba* subsp. *chalepensis*, like Mrs Boucher's in Hertford confirmed by Tim Rich who is an expert in the family. A useful list of the more remarkable plants of this locality was received later from Elizabeth Norman, who also reported the giant knotweed *Reynoutria sachalinensis* and an alien bramble *Rubus spectabilis* in Holland Park, 'obvious now that so many trees are down'.

Other localities supplied new records, although they have been investigated before. In the case of 'Scrubs Wood', an inappropriate name for the strip of land between Wormwood Scrubs and the railway lines out of Paddington, John Latham found whitlow-grass *Erophila verna* and rue-leaved saxifrage *Saxifraga tridactylites*, species which often grow together on old walls, but are rare in London. Previous surveys of this strip, which is likely to be brought back into use by British Rail in connection with extra freight traffic from the Channel Tunnel, were too late in the year for these species to have been visible. By the

Welsh Harp Reservoir, the known orchid flora was further increased when Leslie Williams found two plants of the southern marsh-orchid *Dactylorhiza praetermissa*. A very different wet place is the newly created pond in Haggerston Park, Hackney (and on my not very old maps there is not even a park at the grid reference indicated) near which Anthony Vaughan found strawberry clover *Trifolium fragiferum*; he suggests that it was introduced accidentally with the seed of commoner clovers also present.

The remaining v.c. 21 records to be mentioned are all except one from further north. Pride of place must go to David Bevan's solitary plant of lesser water-plantain *Baldellia ranunculoides* on Glebelands, a relic of Finchley Common. This is where the species was last seen in Middlesex, in 1947. In previous summers the ground here had been dry, but in 1988 there was even enough water for hair-leaved water-crowfoot *Ranunculus trichophyllus*. Nearby in Coppetts Wood there was a plant of pyramidal orchid *Anacamptis pyramidalis* which later was devoured by a slug. In the St Pancras and Islington Cemetery nearby, Joanne Ferns's finds included wild basil *Clinopodium vulgare* and a hybrid cinquefoil. The Paddington Cemetery at Mill Hill and its extension gave Diana Griffith heath speedwell *Veronica officinalis* and two sedges *Carex flacca* and *C. ovalis*. In the car park at Whetstone mentioned here last year (Burton 1988: 176) Dr Griffith found the alien *Malva parviflora*, not identified until 1988. A long list of plants found by June Mott on a building site on former railway land at Green Dragon Lane, Enfield included the strawberry-like *Duchesnea indica*, identified for her by Mr Bevan, musk mallow *Malva moschata*, hoary plantain *Plantago media* and a pretty variety of great hairy willow-herb *Epilobium hirsutum* with very pale pink flowers. Mr Vaughan inspected an area near Scratch Wood disturbed by the removal of storm-damaged trees and found hoary mustard *Hirschfeldia incana*; this alien can be expected to persist, at least until a woodland canopy closes over it. In Pond Wood, east of Potters Bar, P. J. Kerslake-Smith made a plant list intended for a new flora of Hertfordshire in preparation, though the wood has never been in that county, so furnishing exact details of the locality of isolated but probably native plants of butcher's broom *Ruscus aculeatus*. In the Bentley Priory Site of Special Scientific Interest, Mr Bevan found quaking grass *Briza media*, a rarity in north London, and one of the more difficult meadow-grasses *Poa subcaerulea*, confirmed by Dr T. R. Cope of the Kew Herbarium.

The latter locality, and the grassy place by the Thames at Hampton where Adrian Grenfell found musk stork's-bill *Erodium moschatum* in quantity, are the only places in v.c. 21 mentioned here which happen to fall in B.S.B.I. Monitoring Scheme squares. This paper has no records from the parts of the vice-county which are now in administrative counties.

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Obituaries

ALICE GERTRUDE SIDE, 1911-1988

Trudy Side was a member of the Botany Committee from 1960 until she left the London Natural History Society in 1975. She was Curator of the Herbarium for four years, Chairman of the Committee for the following four years, and Recorder for Bryophytes and Lichens for the last ten years of her membership. She also played a prominent part in the Society's plant-mapping scheme in the late 1960s and early 1970s.

Trudy and her husband Ken, a leading amateur entomologist, spent most of their lives as teachers near Dartford. Throughout the 50s and 60s, Trudy was head teacher of Stone Infants' School, and they lived in the school house until moving to Cuxton, further out in Kent, in 1966. Nothing is known of her early interest in natural history; by 1952, before she had joined any of the societies in which in time she was to play a prominent role, she found *Lathyrus tuberosus* across the river at Grays, the earliest date I can find against her initials in the L.N.H.S. plant records. It was probably then already well developed, for they joined this Society in 1954 and contributed to the founding of the Kent Field Club in 1955; Trudy joined the British Bryological Society in 1956. From then on, if not before, bryophytes were her main natural history interest, but she was also extremely well informed about lichens, ferns and flowering plants. Bryophytes, lichens and ferns played a minor role in the flora of two areas in which she maintained a continuing interest, the old chalk-pits of north-west Kent, now almost all filled with rubbish, and the saltmarshes further out in the estuary. In the latter habitat in 1959 she made the first record for West Kent of *Zostera hornemanniana*. In 1964 she started a survey of an area at Egypt Bay where a new sea-wall had prevented the tide from reaching a substantial area of saltmarsh; in seven years its varied flora had changed to a continuous growth of what is now called *Elymus pycnanthus*, as it still remains, no more useful and certainly less attractive than it had been before it was closed off. Trudy's comment about the last year of her survey is characteristic: 'The marsh had a very obvious addition this year, the latest and tallest invader, no doubt planted by man, a noticeboard with the one word PRIVATE on it.'

The late 1960s were the period of Trudy's most intense activity. Apart from the work for the L.N.H.S., the move and the survey of Egypt Bay already mentioned, she and Ken had become joint secretaries of the Kent Field Club in 1964 and she was exploring the bryoflora of the whole county even more thoroughly than it had been in the two previous decades by Francis Rose, who remained the Club's bryophyte recorder until 1970, the year after he moved out of the county. Among the duties of the secretaryship was editing the Club's *Bulletin*, which often also meant writing large chunks of the text. The bryological work culminated in her *Atlas of the Bryophytes Found in Kent*, published in 1970 as a volume of the Club's *Transactions*.

A subsequent widening of their horizons is indicated by what appears to be Ken and Trudy's first holiday abroad in 1971, when a visit to the Alps resulted in the first of a number of illustrated lectures to the L.N.H.S. and other bodies. In 1975, she was elected a member of the Council of the British Bryological Society and became its first General Referee, to whom beginners were allowed to send specimens even of common bryophytes for identification.

Trudy was approaching what she called the end of her allotted span before there was any real let-up in her activity. The joint secretaryship was given up in 1977, and Ken died in 1979*. An operation in 1982 reduced her powers of walking, but not as much as she had feared, and she led a field meeting of the K.F.C., of which she had been Chairman for a couple of years from 1984, then President for as many more, only four months before she died.

The Kent Field Club and British Bryological Society will both miss her

*Ken Side's obituary appeared in *The London Naturalist*, No. 59 (1980).

enthusiastic participation in their social activities. When the B.B.S. invited several prominent members to contribute reminiscences in celebration of its golden jubilee, she was an obvious choice, in spite of having joined only about 25 years before, and wrote 'The B.B.S. has been for me a Society for the Ordinary Member...I learned that there were new county records to be found, not in Kent for there it appeared that Francis Rose had seen everything...I have found a number of new records since then, all of them within the scope of ordinary members for they were all gathered at random...' Many Ordinary Members of both societies and neither have learned from her that mosses are not more difficult to identify than vascular plants, only smaller. Short of stature herself, she claimed that being closer to the ground made it easier for her to see the small plants there, but many of her discoveries arose from patient work at home with the microscope.

R. M. BURTON

List of publications by Mrs A. G. Side:

This does not claim to be an exhaustive list of Trudy's publications. Deliberate omissions are 52 field meeting reports, 17 bryophyte recorder's notes, six rainfall reports and about 13 editorials in the *Bulletin of the Kent Field Club*.

1962 Note on *Spartina maritima*. *Bull. Kent Fld Club* 7: 14.

— — *Tortella inflexa* (Bruch) Broth. in Kent 1961. *Bull. Kent Fld Club* 7: 15-16.

1965 (with F. H. Brightman). Notes on the bryophytes and lichens of Ruxley Gravel Pit. *Trans. Kent Fld Club* 3: 69-70.

1967 Bryological note. *Bull. Kent Fld Club* 12: 39.

— — Observations made while looking for *Tortella inflexa* in Kent. *Trans. Kent Fld Club* 3: 133-135.

— — *Pyrola rotundifolia* in the London Area of Kent. *Lond. Nat.* 46: 24-25.

1970 An atlas of the bryophytes found in Kent. *Trans. Kent Fld Club* 4: 140 pages.

1972 A note on the plant mapping scheme. *Lond. Nat.* 50: 95-97.

1973 Vegetational changes at Egypt Bay following the exclusion of tidal water 1964-71. *Trans. Kent Fld Club* 5: 60-73.

1974 Entomological note. *Bull. Kent Fld Club* 19: 38-39.

— — (with H. L. K. Whitehouse). *Tortula amplexa* (Lesq.) Steere in Britain. *J. Bryol.* 8: 15-18.

1976 The Kent Field Club: the first 21 years. *Trans. Kent Fld Club* 6: 3-4.

1977 Bryophytes in arable fields in Kent. *Trans. Kent Fld Club* 6: 63-70.

1978 The distribution of some previously under-recorded species of moss in Kent. *Trans. Kent Fld Club* 6: 143-147.

1981 [Summary of paper 'Amateur bryological work in Kent' given to 1980 AGM of British Bryological Society]. *Bull. Br. Bryol. Soc.* 37: 8-9.

1982 Two 700 year old mosses. *Trans. Kent Fld Club* 9: 5-6.

1983 [Reminiscences of the B.B.S.] *Bull. Br. Bryol. Soc.* 42: 44-45.

— — The occurrence of tubers on *Barbula typhacea* (Brid.) Mitt. *J. Bryol.* 12: 620-621.

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FRANCIS HENRY JONES, 1919-1988

Frank Jones died on 1 November 1988. There have been few to equal his contribution to the Society over so many years in such an unassuming and loyal way. He joined the Society in 1950, edited eleven issues of the *London Bird Report* – for the years 1953 to 1957 and 1963 to 1968 inclusive – and was a member of the Records Committee and a contributor to the *Report* continuously from 1953 until his death. He was Chairman of the Records Committee from 1955 to 1957 and assisted in the production of *The Birds of the London Area* (1964). He was one of the contributors to the *Atlas of Breeding Birds of the London Area* (1977).

Frank was the essence of the self-effacing voluntary contributor. He was prepared to do anything and would as readily help with the mundane assembly and clipping up of papers as with the more interesting *L.B.R.* editorial work. He was quiet and unassuming in the extreme, yet when it mattered – when, for instance, the Records Committee was showing signs of exercising poor judgement on the acceptance of a rarity, or if it was struggling with some knotty problem of policy – Frank was there with a soundly thought out and telling contribution that brought the committee back to its senses. Successive Editors benefited enormously from the clarity and accuracy of the drafts that he wrote year after year.

Frank was born in west London on 7 September 1919 but both his parents came from Hampshire and as a child he spent all of his school holidays with his relatives in the country. It was from this early age that he acquired his interest in Nature and birds in particular. From these holidays he also developed an interest in Roman history for he spent much of his time at Silchester with its Roman walls.

In 1939 he enlisted in the R.A.M.C., he served in France until evacuated in 1940 only to return shortly after D-Day, and was in the medical unit that entered Belsen, an experience which had a very profound effect on him as a young man. He also served in the Middle East. Upon his discharge from the Army in 1946, he joined British European Airways in their accounting department and continued with British Airways when the two airlines amalgamated, until his retirement in 1982.

Although he had for many years suffered from angina, Frank was a keen walker and on the day he died he had been walking on the West Yorkshire moors. He collapsed and died at Horton-in-Ribbleside Station. One of his interests was preserved railways and the fact that the Settle-Carlisle railway was at that time under threat of closure might have accounted for his being there on that day.

MIKE EARP

Balance Sheet as at 30 June 1988

[illegible]

Book Review

Heather in England and Wales. Edited by R. G. H. Bunce. I.T.E. Research Publication No 3. H.M.S.O. 1989. 40pp. £5.90. ISBN 0 11 701422 2.

This publication is intended as a demonstration of how a short-term project can produce rapid results at a national level. Satellite images obtained in 1984 were used as a source of information on the distribution and extent of vegetation characterised by heather. The data were checked by ground surveys in a sample of sites (those in Northumbria in table 2 have their grid references presented differently from all the rest). They were then compared with the results of earlier surveys for which the bulk of the data had been obtained from conventional aerial photography. The comparisons were used to check the widespread assumption that *Calluna* is declining in England and Wales. The results are discussed in four regional assessments by locally-based authors.

The conclusion reached is that the major decline of heather was between 1960 and 1980, that is to say before the Landsat photography was carried out. Changes in the 1980s have been within the calculated margin of error of the method. The satellite data are virtually ignored in the regional assessments. Nevertheless it is these which make the publication useful, containing the detailed description of the reasons for the decline of heather, insofar as they are known, and statements of research needs, which do not include any more aerial surveys. There is a clear distinction between south and east England where the main problem is successional change on ungrazed lowland heath, and Wales and northern England where changes in land use and management have reduced the much larger amounts of heather moorland.

R. M. BURTON

The London Naturalist

Instructions to contributors

Submission of papers

Papers relevant to the natural history and archaeology of the London Area should be submitted to the editor, Mr K. H. Hyatt, c/o Department of Zoology, British Museum (Natural History), Cromwell Road, London SW7 5BD, before the end of January if they are to be considered for publication in the same year. They should be typed, with double spacing and wide (three cm) margins, on one side of the paper. Authors must retain a duplicate copy. Papers should include at the beginning an abstract, summary, or synopsis.

Text

Locality spellings should follow the latest editions of the maps published by the Ordnance Survey. Capitalization should be kept to a minimum. Common names of animals and plants must begin with lower-case initials, and scientific names must be underlined. When both common and Latin names are given there should be no brackets or commas separating them. Genus names should appear in full where first used within each paragraph. When scientific names are taken from a standard work, which must be cited, authorities should be omitted. In descriptive matter numbers under 10 should be in words, except in a strictly numerical context. Dates should follow the logical sequence of day, month, year (i.e. 25 December 1971). Measurements should be in metric and follow the SI system (Système International d'Unités), with imperial equivalents in parentheses where appropriate. There should be no full point following Dr, Mr, Mrs or St. Lists should be in natural, alphabetical or numerical order.

References

Reference citation should be based on the Madison rules (in *Bull. Torrey bot. Club* **22**: 130-132 (1895)), except that a colon should always precede a page number. Capitalization in titles of papers in journals should be kept to a minimum. Journal titles should follow the abbreviations in the *World List of Scientific Periodicals* and be underlined. Examples are as follows:

In text:

Meadows (1970 : 80) or (Meadows 1970).

In references:

MEADOWS, B. S. 1970. Observations on the return of fishes to a polluted tributary of the River Thames 1964-9. *Lond. Nat.* **49**: 76-81.

MELLANBY, K. 1970. *Pesticides and Pollution*. Ed. 2. Collins, London.

WHITE, K. G. 1959. Dimsdale Hall moat, part II. *Trans. a. Rep. N. Staffs. Fld Club* **92**: 39-45.

Illustrations

Distribution maps should be submitted in the form of a Recording Map with symbols in Indian ink or Letraset. Solid dots are used to indicate contemporary or recent presence, circles for old records and crosses (not pluses) for other information, such as introduced species. Tetrad dots and circles should be 4.0 mm and tetrad crosses 5.0 mm, with a line thickness of 0.8 mm; all monad symbols should be 1.6 mm with a line thickness 0.5 mm. The caption should be written outside the frame of the map and will be set up by the printer.

Line drawings should be in Indian ink on white card, larger than the printed size. Place names, etc., must be produced with stencils or Letraset. Captions should be separate as they will be set up by the printer.

Photographs should be glossy black-and-white prints, of good contrast, preferably half-plate in size.

Proofs

Proofs will be sent to authors for scrutiny, but only essential corrections can be made at that stage.

Reprints

Up to 25 free reprints will be supplied on request. Additional copies may be purchased if ordered when the proofs are returned.

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